



# Broadcast News

Volume No. 157, December 1975



A New Portable Video Color Camera . . . TK-76



Broadcast equipment designed today for the day after tomorrow.

# BEFORE YOU BUY A NEW VTR, LOOK AT A REALLY NEW VTR.

**RCA's new technology TR-600 proves medium price and small size can add up to unsurpassed performance. Check the specs — check the price — and you'll discover that the newest offers you the most.**

It's about half the size of standard quad VTR's. With built-in automatics that

used to cost you extra and the latest technology incorporated in a design that gives you superb picture performance.

For example, computer designed and tested modules give superior reliability; unique straight line threading; LED diagnostic indicators flash warnings before malfunctions get out of hand. and its new integrated design cuts active electronic devices by 45%.

Check with your RCA representative. He's got the total value story on the one VTR that's really new.

## RCA



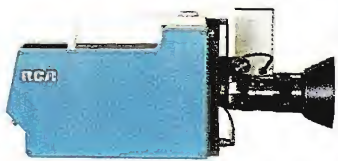


**Page 8****WREG-TV Memphis Builds on the Banks of the Mississippi**

The move was a big one—from cramped quarters in a hotel basement to a new, fully-equipped broadcast center built near the River. This article details a magnificent technical facility.

**Page 22****WBEN Automates New TV and FM Transmitters**

Twin 40 kW FM transmitters and a parallel 30 kW lowband TV system operated by WBEN, Buffalo, are remote controlled from the studio, with full redundancy. A versatile, unusual installation.

**Page 28****A Portable Video Color Camera with Film Camera Freedom**

The TK-76 portable TV camera, with dimensions, weight, and handling characteristics similar to a 16mm cine camera, is showcased in this article. An actual size photo illustration of this camera is in the centerfold.

**Page 34****British Cassette Duplicator Keeps Production Up with Broadcast-Type Equipment**

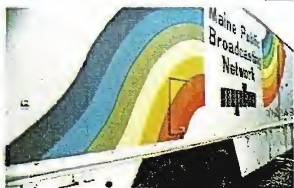
In the high-volume cassette duplication business, downtime means lost revenue. With the help of a TK-28, TR-60 and TR-70, London's Audio + Video Ltd. cranks out thousands of video cassette copies.

**Page 36****Film "Cart" System Frees a Telecine Island for Production**

KYTV, Springfield, Mo., needed more machine capability for production. A TK-28 Telecine island with a TGP-1624 film "cart" system helped relieve the pressure.

**Page 39****NBC Burbank Adds Four TR-600 VTR's**

Even with a tape complement of 26 quadriplex machines and four TCR-100's, NBC Burbank finds times when more machines could be used. Four new TR-600's have been added to handle expanding needs.

**Page 42****Maine Public Broadcasting Network—A Continuing Success Story**

Created in 1961, MPBN continues to expand. With updated studio and mobile facilities, it is now a major New England television production center.

**Page 46****Versatile Electronic Graphics Production System**

Video IV is more than a character generator system. This technical presentation covers the system's operational features and performance capabilities.

**Page 55****A Super-Performance Antenna for Lowband VHF**

For Ch. 2-6 broadcasters, the new Turnstile II provides a 2:1 improvement in VSWR, virtually eliminating antenna ghosting, resulting in sharper, clearer pictures.



# View Finder

## Home TV Sets "Think In Color" With New ColorTrak System

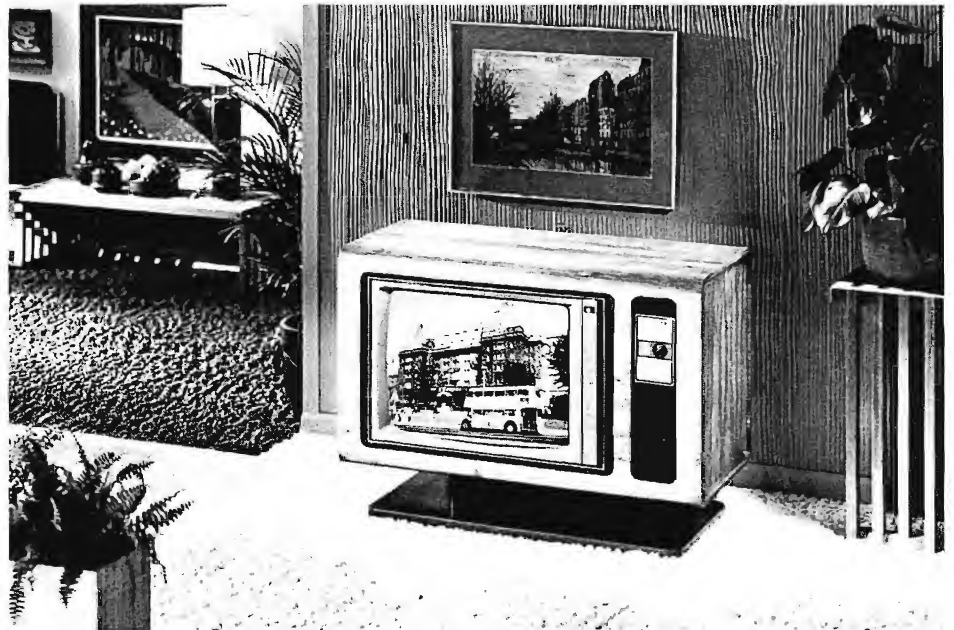
The ColorTrak System available in some current RCA TV models combines a new solid state chassis with a new filtered phosphor picture tube to create a set that "thinks in color". The ColorTrak System electronically tracks the broadcast television signal and automatically adjusts the picture to life-like color. It represents the most significant advance in RCA color television design in more than a decade.

The use of filtered phosphors reduces the reflection from ambient light, producing clearer blacks, and enabling the colors to stand out more vividly with greatly improved contrast in the picture.

An advanced remote control version of the new ColorTrak chassis uses for the first time in RCA receivers a total of ten custom-designed digital logic integrated circuits that combine the functions of more than 5,000 ordinary transistors. A touchbutton XL-100 Control Center featured on the new deluxe models, operates all of the receiver's primary controls and displays both time of day and the TV channel on the screen.

Features of the basic ColorTrak System include:

- A new Super Accufilter black matrix picture tube in both 19-inch and 25-inch (diagonal) picture screen sizes.
- Automatic room-light picture control.
- 100 percent solid state chassis with components mounted on six module boards.
- Automatic color control that "thinks in color" by automatically adjusting flesh tones to the color-tint settings selected by the viewer even when the channels are changed.
- Automatic contrast/color tracking.
- New electronic varactor tuners.



RCA's MOST AUTOMATIC COLOR—Ball games in the afternoon will be easier on armchair TV viewers with the development of a new ColorTrak television system by RCA that among other advances, automatically adjusts picture brightness to room light and maintains picture contrast at the TV set to prevent fading, thus avoiding washed-out pictures.

## Two Outside Broadcast Units And TV Studio Equipment Ordered By Iranian Television Network

The National Iranian Radio and Television network has ordered RCA television studio and outside broadcast equipment valued at more than \$1 million.

The equipment order includes two small, highly maneuverable TV vans equipped to cover and tape-record news, sports and other events while in motion.

The 17-foot outside broadcast units, designed and equipped at RCA Jersey Limited, each will employ two RCA TKP-45 portable color TV cameras, a TR-600 video tape recorder, and switching and audio systems.

The Iranian network also has purchased six TR-600 video tape recorders

and a Video IV character generating system for installation in its new Tehran TV production center, scheduled to become operational in mid-1976.

The Iranian purchase brings to more than 100 the number of TR-600's ordered since the recorder was introduced.

The specially designed van was shown to broadcasters at the International Television Symposium and Technical Exhibition at Montreux, Switzerland. It includes a forward camera mount atop the windshield, with a hatch provided in the cab roof so that the camera operator may stand upright to shoot pictures ahead of or on either side of the vehicle.

The van's tailgate converts to a second, rear-view camera platform when the van is leading a parade or procession. A third camera vantage point is provided on the roof deck for use when panoramic picture sweeps are required.



### Three Sacramento TV Stations Install New RCA Transmitters

All three VHF television stations in Sacramento, Calif., have installed new RCA transmitting systems.

KOVR-TV and KXTV-TV are on-air with RCA TT-35FH 35-kilowatt highband parallel transmitters. KCRA-TV is operating a TT-30FL, a 30-kilowatt low-band parallel transmitter. The three installations include equipment for transmitters remote control and monitoring.

The new transmitters have replaced units which are 15 to 20 years old and provide the operational advantages of newer designs, including capability for remote control or unattended operation.

The new units were installed at the Transtower facility located at Walnut Grove, Calif. Transtower, owned jointly by the three stations, includes a 1500-foot tower and antenna array designed and built by RCA. The array was one of the earliest multiple TV antenna sites erected.

### Canadian Broadcasting Corporation To Use RCA Video IV Character Generating Systems For 1976 Olympic Coverage

The Canadian Broadcasting Corporation will use 13 RCA Video IV character generating systems in television coverage of the 1976 Montreal summer Olympics.

The equipment was ordered by ORTO (Olympics Radio and Television Organization) of the CBC, for installation in mobile television broadcast units that will be located throughout the Olympic site. CBC will act as host broadcaster for the 1976 Olympic Games.

ORTO will supply all radio and television equipment and services as required for world-wide coverage of the Games by an international group of some 70 television and 110 radio organizations.

Video IV has capacity and flexibility well beyond the traditional character generators used in the TV industry. During the Olympics the RCA systems will add and update such visual information as team rosters, winners and scores to TV pictures originating at the Games' sites. The system's graphic capabilities also can be used to display course layouts and similar information.

With the system's unique "on site font generation" feature, the Video IV operator uses the keyboard to produce symbols, or to draw bar charts, maps and other graphics, in addition to printed messages.

### Rust Craft Broadcasting Orders RCA Color TV Cameras For Four Group Stations

Rust Craft Broadcasting Co., headquartered in Pittsburgh, Pa., has ordered RCA "live" color TV studio cameras valued at more than \$500,000 for its station group facilities.

The order includes eight TK-45A cameras. Two cameras each will be installed at four of the group's stations: WSTV-TV, Steubenville, Ohio; WROC-TV, Rochester, N.Y.; WRCB-TV, Chattanooga, Tenn.; and WRDW-TV, Augusta, Ga.

Ralph E. Becker, the group's Vice President for Television, said that the camera purchase is part of an ongoing program to upgrade Rust Craft station broadcast equipment to provide viewers with the best possible service.

### RCA Developing Tiny Space TV Camera

RCA is developing a tubeless television camera—potentially no larger than a pack of cigarettes—for possible use in NASA's advanced space missions. The prototype black-and-white camera will employ an advanced type of image sensor called a charge-coupled device (CCD). The CCD's will make possible an ultra-small lightweight camera capable of operating in space on very low power, according to Bert Soltoff, Program Manager for RCA's Astro-Electronics Division, near Princeton, N. J., where the work is being done.

The CCD's are about the size of postage stamps and perform the same functions as vidicons or other pickup tubes in conventional cameras. Those planned for use in the space camera are 512 x 320 element devices, the largest and highest resolution CCD television image sensors now in production.

Mr. Soltoff said a scanning technique will be developed for the space camera that will assure its compatibility with the 525-line standard broadcast television. This will make it possible to operate the camera in conjunction with current TV sets, monitors, video recorders, transmitters and other equipment.

### RCA TK-76: the TV camera with film camera freedom.



## NO BACKPACK.

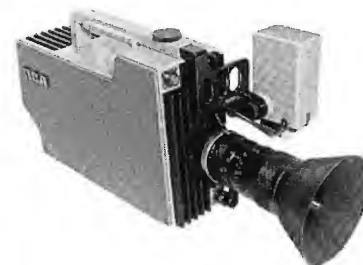
A single-unit TK-76 Color Camera contains all the electronics, yet weighs just 19 pounds. It offers 12v. DC or 6-pound battery pack operation.

Among its many features: automatic iris and white balance; horizontal and vertical aperture correction; exclusive sealed, shock-mounted prism optics; built-in sync generator with gen-lock.

Price is a major feature: under \$35,000.

If all this says "news camera", fine. But the TK-76 is great for many live or taped remotes. And for specialized studio assignments, too.

Join the networks and the many knowledgeable broadcasters who are reserving the TK-76 for '76 delivery. Place your order now for the one TV camera with film camera freedom. For details, write RCA Camera, Building 2-2, Dept. A1, Camden, NJ 08102.

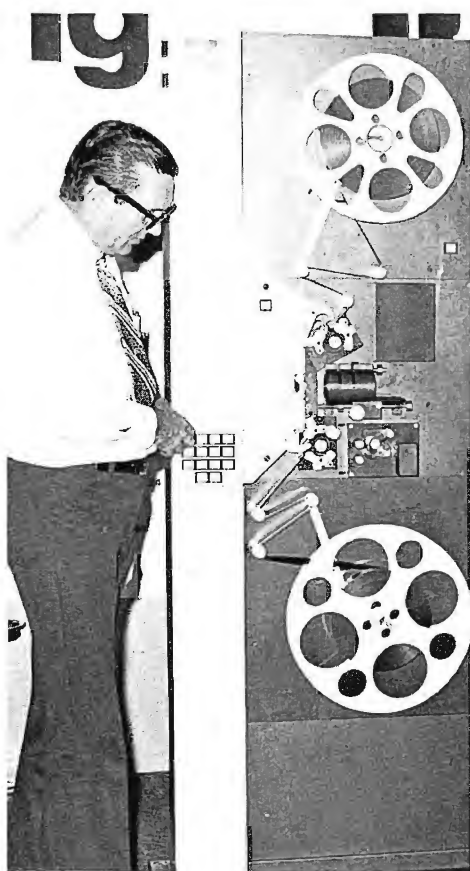


# RCA





RCA's exhibit at the SMPTE Convention included a mix of video and film systems. Introduced at the show was a new servo-controlled 35mm Projector, the FR-35 (below).



### New 35mm Film Projector Introduced At SMPTE Meeting

Both film and video systems were featured in the RCA exhibit at the Society of Motion Picture and Television Engineers Convention in Los Angeles. Highlighted was a new servo-controlled 35mm Film Projector, the FR-35. Designed for direct projection or for telecine use, the projector incorporates numerous innovations, including instant stop and start; variable speed operation; cueing on frame. It operates in Forward or Reverse at cine or high speed (six times cine), with extremely accurate picture registration.

The multi-function capability of the FR-35 was demonstrated in a telecine island with a TK-28 color film camera equipped with ASCET (Automatic System for Correction of Errors in Telecine). This color film system provides automatic circuitry to control black level, white level, flare, black balance, white balance and gamma. The result

is dramatically superior reproduction of film on television.

Also demonstrated was the TCP-1624 Television Cartridge Film Projector, a unique film handling system that includes two self-threading 16mm projectors capable of handling film cartridges of 10 seconds to two minutes duration.

Cartridges are loaded on a removable magazine tray which holds 24 "carts". The system can be set up for single play or automatic sequence operation, providing the means for automatic film commercial playbacks on television.

Integrated with the telecine system and interlocked to it was the PM-86-SL, a new Master Magnetic Recorder, equipped with a smooth and continuous (non-stopping) servo drive motor system.

Also exhibited was the TK-76 Portable Color TV Camera, a compact, lightweight unit that needs no backpack; operates like a film camera; accommodates cine lenses, and offers the "go-anywhere" ruggedness of a film camera.



### **Brazilian TV Station Orders RCA Studio And Mobile Broadcast Systems**

In a major expansion of its color television operations, Radio TV Bandeirantes, an independent Brazilian broadcaster in Sao Paulo, has ordered RCA color television broadcast equipment valued at approximately \$1.6 million.

The order includes RCA's latest "live" color TV cameras, film originating systems and production switching equipment for converting the station's studio and on-location facilities to full color operations.

TV Bandeirantes began black and white telecasts in 1967. With the new equipment in use later this year, it will reach the 10 million residents of the Sao Paulo area with full color broadcasts.

The broadcaster's studio in Sao Paulo is being equipped with five RCA TK-45 color cameras, two complete TK-28 film islands, and two TS-70 video production switchers and other studio equipment.

Also included in the order is a mobile TV trailer which will enable the station to originate broadcasts of cultural and sporting events from around the State of Sao Paulo. The outside broadcast van will be equipped with three TK-45's, a TKP-45 portable color TV camera, a TS-70 switcher, and a TR-61 video tape recorder.

### **Ozone To Be Investigated By New NASA Sensing Device Aboard RCA-Built Spacecraft**

Ozone, the earth's invisible sun shield which is currently the center of scientific and public concern, will be investigated systematically for the first time by NASA spacecraft.

The RCA-built satellite, called Atmosphere Explorer-E (AE-E), is scheduled for launch in November. It will carry a new sensor to aid scientists in their investigations of the effects of pollutants on ozone levels.

Ozone is a protective shield of super charged oxygen that acts as a buffer against ultraviolet radiation directly bombarding earth. Some scientists believe that chemicals such as freon and other fluorocarbons may be destroying the ozone, posing potentially far-reaching health consequences for mankind.

As a result, Congress recently funded research into the ozone depletion issue.

AE-E, is the third in a series of these scientific satellites designed to probe a little-known region of the upper atmosphere known as the thermosphere.

Using an on-board propulsion system, the spacecraft will lower itself to within 85 miles of earth to collect data on the ozone region. This region starts from the ground and extends to about 30 miles above earth.

The new sensor, called a Backscatter Ultraviolet (BUV) spectrophotometer, will sound the region to determine ozone density and vertical profile by measuring the reflectance of sunlight. The BUV was first flown on the NASA Nimbus 4 satellite in 1970. Since the Atmosphere Explorer satellite flies at a much lower altitude, 85 miles versus 450 miles, it will be able to provide six times the data resolution. In addition, the satellite's ability to alter its orbit makes possible ozone readings at various earth locations at different times each day, rather than at just one location at the same time each day.

### **Austrian Broadcaster To Use RCA TV Equipment For Winter Olympics Coverage**

The Austrian broadcasting agency, Oesterreichischer Rundfunk (ORF), will use nearly \$2 million worth of RCA television broadcast equipment in covering the upcoming Winter Olympics at Innsbruck.

ORF crews will use eight TK-44 color television cameras to originate the TV coverage for worldwide distribution.

Ten TR-70C video tape recorders will be used for recording the Olympic events. Most of the recorders will come from ORF's huge TV production complex in Vienna. Two more tape units and time code editing equipment have been leased from RCA for the additional capacity needed.

With the editing facilities, incoming film and tape programming can be edited and put on the air immediately, or edited for shipment to various countries for later domestic broadcast.

ORF also will lease five complete RCA TK-28 film originating systems. The film (telecine) systems will be used to convert programs recorded on motion picture film and slides to the electronic medium for TV broadcasting and for satellite relay.

## **RCA TK-76: the TV camera with film camera freedom.**



# **UNDER \$35,000.**

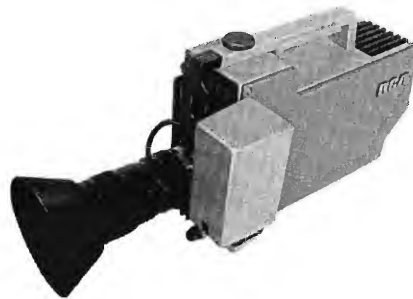
You can pay a lot more for a lot less color TV camera.

For instance, you won't find a shock-mounted optical system in any other portable. At any price.

In the TK-76, you will find fast turn-on, prism optics, built-in sync generator with gen-lock, automatic iris, automatic white balance, adjustable viewfinder, and 12v. DC or battery pack operation, all in a shoulder-mounted, 19-pound camera that needs no backpack nor control unit, and all for less than \$35,000.

The TK-76's film camera freedom lets one or two people do news remotes, sports, special events, documentaries, even profitable local spot commercials.

Never has a camera of this quality been available in this size and at this price. Why not reserve your TK-76 now for the many news-making events of '76? Call your RCA Representative, or write RCA Camera, Building 2-2, Dept. A1, Camden, NJ 08102.



# **RCA**





A 1975 David Sarnoff Award for Outstanding Technical Achievement, was presented to Arch C. Luther (center), Chief Engineer, Broadcast Systems, "for his many outstanding technical contributions enhancing RCA's reputation as a leading supplier of television systems." The presentation was made by Chairman Robert W. Sarnoff (left), with Dr. James Hillier, Executive Vice President, Research and Engineering.

### **Luther, Chief Engineer For RCA Broadcast Systems, Wins Company's Highest Achievement Award**

Arch C. Luther, Chief Engineer, RCA Broadcast Systems, has been presented a 1975 David Sarnoff Award for Outstanding Technical Achievement, the company's top technical honor.

Presented by RCA Chairman Robert W. Sarnoff, the award was in recognition of Mr. Luther's "many contributions enhancing RCA's reputation as a leading supplier of television systems".

Mr. Luther has been involved in the design and development of RCA broadcast equipment since 1950 when he joined the company in Camden after graduation from the Massachusetts Institute of Technology with a bachelor's degree in electrical engineering. He has held the Chief Engineer's post since 1971.

One of Mr. Luther's accomplishments was in conceptualizing the design of the TCR-100 video tape cartridge recorder. In the late 1950's, he led the first efforts in RCA Broadcast Systems to apply solid state technology to the design of new products. By 1961, largely as the result of Mr. Luther's activity, RCA introduced the TR-22 video tape recorder, the industry's first such machine to employ an all-solid-state design.

During his RCA career, Mr. Luther has been awarded 29 patents relating to broadcast systems and subsystems. Active in the Institute of Electrical and Electronic Engineers, especially in the area of magnetic recording, he received the IEEE Fellow Award in 1974. He was presented the 1969 Fellow Award of the Society of Motion Picture and Television Engineers and in 1973 won its David Sarnoff Gold Medal for major contributions to magnetic video recording technology.

### **Audio Visual Training Package Available From Technical Services**

Technical Services is a "something for everyone" operation within Broadcast Systems, offering a variety of products and services to broadcasters.

Recently added to the line is an audio-visual training package for users of the RCA TK-44B Color Camera. The JW-5 Package consists of 256 slides, three audio cassettes and ten study manuals, covering in detail the set-up procedures for NTSC TK-44B cameras. This is the first of a series of audio-visual packages being developed by John Wentworth, Manager, Broadcast Technical Training.

Additional Technical Services include:

Solid State Control boxes identical to those now provided with new TP-7 Slide Projectors. Permits updating of older projectors to provide glitch-free solid state relays and modern logic circuitry.

TP-7 Refurbishing plan. Includes providing solid state control boxes, installing new parts in TP-7's as may be required, refinishing, testing, and adjusting the projector systems to original performance specifications.

TSP-107 Multi-Purpose Switching Systems. Ten small remote-control switchers for secondary switching requirements where vertical-interval switching is unnecessary.

Update kit for RCA TA-60B Mixing Amplifiers. Provides for replacing LDR's with Light Emitting Diode Photoresistors to achieve long-term performance stability.

A complete refurbishing service for RCA Broadcast microphones. All microphones are thoroughly tested and certified to be within original performance specifications after rebuilding.

Preventive Maintenance Service plan for RCA TCR-100 Cartridge Tape Recorders. Provides for four-regularly scheduled visits per year by highly qualified RCA personnel to perform a comprehensive step-by-step maintenance service.

For further details, contact RCA Technical Services, Building 2-8, Camden, N. J.



### **RCA Demonstrates Color TV Studio Equipment At Australian Broadcasters Convention**

First demonstrations in Australia of RCA Broadcast Systems' newest color TV studio equipment were conducted in Sydney during the International Electronics Convention '75, sponsored by the Institution of Radio and Electronics Engineers.

RCA's TKP-45 portable color camera was demonstrated with a new portable control unit that gives the camera system more flexibility on wide-ranging assignments.

In video tape equipment, RCA showed its new TR-600 quadruplex system which incorporates many automatic features previously available only as options.

Telecine demonstrations featured a newly-developed accessory for the RCA TK-28 color film originating system. The device promises TV viewers more accurately reproduced color pictures from filmed programs by automatically detecting and correcting minute errors in mid-gray tonal areas while the film is on the air. It is an integral part of the TK-28 ASCET system (Automatic System for Correction of Errors in Telecine).

### **Area Office Established In London To Serve Europe And Africa**

RCA International Ltd. (United Kingdom) has established a new regional office in the London area to consolidate and expand its business operations in radio and TV broadcast equipment.

The new office, located in Sunbury-on-Thames, is headed by Patrick J. Murrin, Vice President, and serves as headquarters of Commercial Communications Systems—Europe, Middle East and Africa.

Mr. Murrin will have overall responsibility for the Region. Reporting to him will be the broadcast equipment sales office, now located in Geneva, Switzerland, and the company's Jersey Isle plant which assembles and conditions video tape recorders and equips mobile vans for TV broadcasters.

The new London office will have marketing support functions previously available only from RCA offices in Camden, N. J., and thus will be able to respond more quickly to customer needs, Mr. Murrin said. Plans also call for expanding the line of products manufactured at the Jersey plant.

### **RCA Providing Telecommunications Systems For New Persian Gulf Resort**

An \$8.7 million contract to design and install a wide range of telecommunications facilities for a major new winter resort under construction on Kish Island in the Persian Gulf has been awarded to RCA.

The facilities will include a radio and TV program production center, cable TV program distribution system, three FM broadcasting stations, a mobile radio network, extensive security systems and a computerized cash register system.

The contract was signed with the Kish Island Development Organization which is building the resort on the five-mile-wide, ten-mile-long island about 15 miles off the south coast of Iran.

Vacationing guests will be able to watch color TV programs produced by a fully-equipped TV production unit at the resort's broadcast center. Equipment will include the broadcast-quality color TV cameras, video tape recorders, TV film systems and other apparatus which RCA supplies to TV stations and networks.

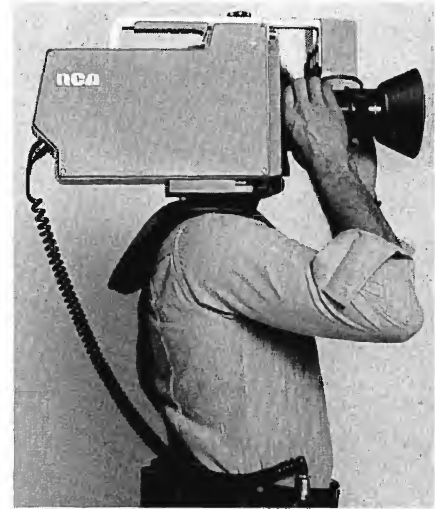
For FM radio broadcasts on the island, RCA will supply three stereo program transmitters and studio equipment to include an automated programmer that can control up to six different sources and store up to 80 program events. Three radio stations and control rooms will originate broadcasts or record programs for later use.

The cable distribution system will be designed to deliver programs to approximately 3,500 solid state color TV receivers in the Kish Island complex. The system also will be able to pick up and distribute off-air broadcasts from Iranian stations on the mainland.

A mobile-two-way radio system operating from eight base stations will provide communications with police, fire, utility and other vehicles. The contract calls for RCA to supply approximately 50 mobile radio units and another 50 portable radios for hand-held communications, as well as 100 radio paging units.

Guest safety also will be protected by a computerized fire and smoke detection system as well as a closed circuit TV system that will be installed throughout the complex. Cash registers used in the resort will be linked to a central computer.

### **RCA TK-76: the TV camera with film camera freedom.**



## **ONE-MAN NEWS.**

Even a one-man crew can get news fast with a TK-76 portable color camera. Aim-and-shoot automatic features deliver film camera quality even in low light. Instant warm-up puts you on-air or on tape just seconds after you're on the scene.

There's no cumbersome backpack or control unit to hold your reporter back from the action. The 19-pound, self-contained TK-76 is powered by a 6-pound battery belt or a car's 12v. DC cigarette lighter.

The TK-76 is great for documentaries and profitable local spot commercials, for specialized sports and studio assignments, too.

Best of all, it's all yours for less than \$35,000.

The list of orders is growing, so place yours now and be way ahead in '76. See your RCA Representative, or write RCA Camera, Building 2-2, Dept. A1, Camden, NJ 08102.



# **RCA**



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# TV-3, MEMPHIS

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BUILDS ON THE BANKS OF THE MISSISSIPPI

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Given the opportunity to plan and equip a new television station, what would you do? For many broadcasters this prospect borders on euphoric fantasy. However, WREG-TV, Ch. 3, Memphis was presented with the golden opportunity and made the most of it.

A pioneer operation spanning more than fifty years in broadcasting—AM-FM and TV—the station had outgrown its cramped quarters in the basement of the venerable Peabody Hotel, a Memphis landmark since 1925.

Expanded program and production needs made it necessary to move to new facilities. The quest for a suitable location was not easy, according to Charles Brakefield, President of WREG-TV. Because the Mississippi River is so closely identified with Memphis, Mr. Brakefield had long hoped to relocate near the river. When some prime riverfront acreage became available in 1973, plans for the new TV-3 surged forward.

The Austin Company was selected to design and construct the new facility, while Chief Engineer Leroy Knight and his staff developed plans for the technical services area. To supplement their concepts for the most efficient equipment arrangements and functional capabilities, staff members visited several stations which had recent experience in building new broadcast facilities. Later, RCA product specialists, proposal and TV systems engineering personnel were involved, reviewing plans and offering additional suggestions for the equipment complement and layout.

From these discussions, equipment lists and system requirements were refined, culminating in a proposal by RCA which was accepted by the WREG-TV management.

Changes in the TV-3 operation have been so major, Mr. Brakefield says, that in effect it is a brand new broadcast station. Nearly the entire technical equipment complement—from transmitters to studio facilities

—was changed in moving to the new site. Even the call letters were changed from WREC-TV to WREG-TV.

New is indeed the word for WREG-TV. Its glass-walled building offers a commanding view of the Mississippi River. In fact, the bustling river with its constant flow of traffic provides an interesting, ever-changing 'tapestry for live and tape productions.

Inside, the decor is modern, functional and richly appointed—an unusually pleasant working environment. The handsome, spacious surroundings represent a quantum change from the snug offices previously occupied by the TV-3 staff at the Peabody Hotel.

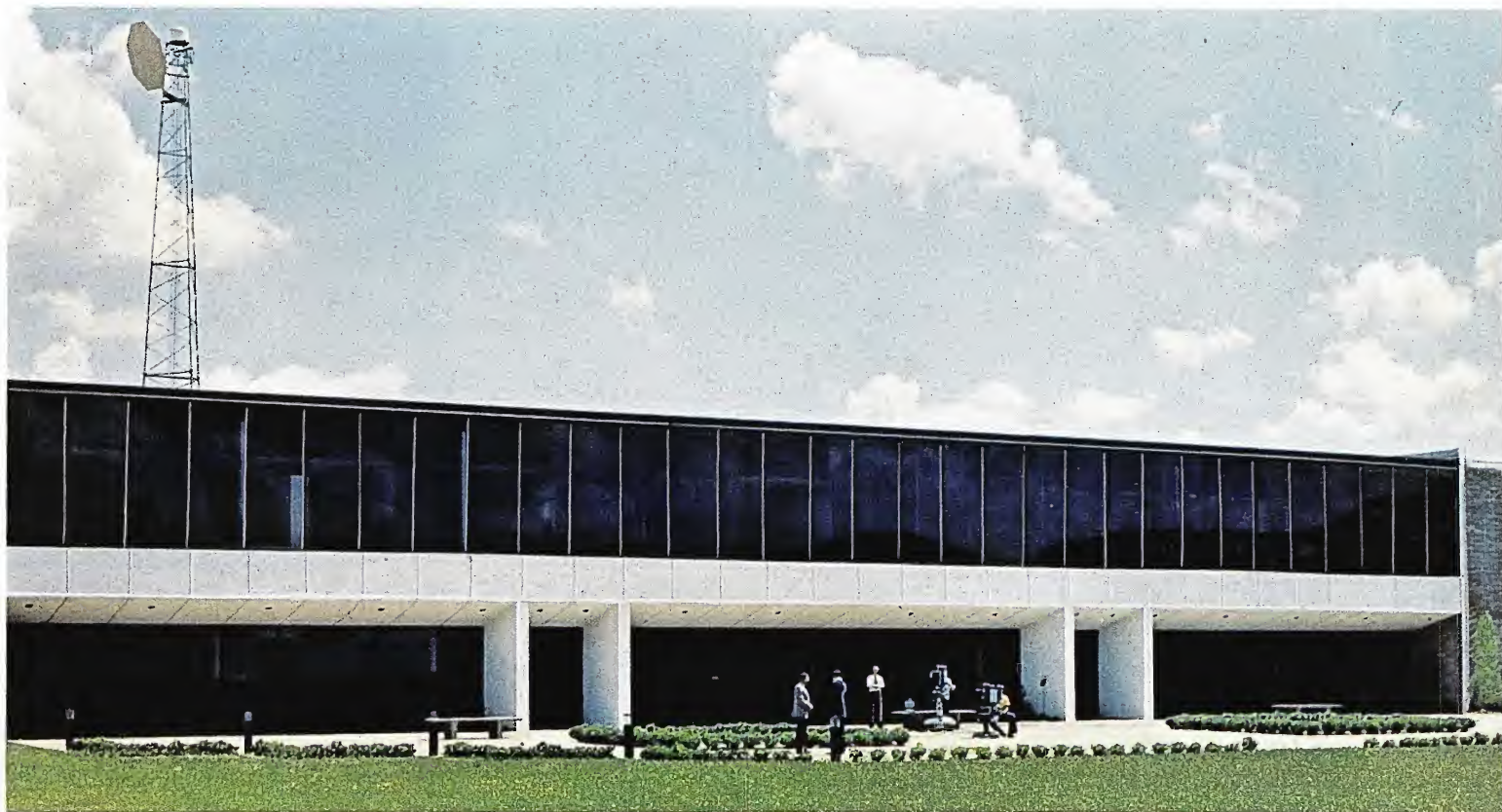
The pleasant environment of the new building and location have been appreciated by employees at all levels. Clients, visitors and talent have also found the new TV-3 to their liking.

Aside from the aesthetics, the new facility has the technical capability to produce more high caliber local and public service programs and commercials.



The rolling Mississippi River provides an impressive backdrop for WREG-TV cameras.





View from the river shows WREG's attractive, functional building. The pleasant terrace setting is often used for outdoor productions.

"Local business, especially retail, is already a significant factor, and will become even more important in the future," Mr. Brakefield noted. "We planned the new station with ample capability to handle anticipated growth in production volume. In addition, the facility is designed to operate around the clock if necessary."

#### Major Equipment Investment

The extended capability for production and 24-hour on-air operation is confirmed by this listing of the new broadcast equipment installed at TV-3.

- 5—TK-45 Color Studio Cameras
- 4—TK-28 Color Film Cameras (2 dual film islands complete with film and slide projectors plus complete TK-27 island from Peabody Hotel)
- 3—TS-70 Video Switchers  
System 200 for Master Control  
System 360 for Studio A  
System 160 for Studio B
- 2—TR-70C TV Tape Recorders (plus one TR-70B from Peabody Hotel)
- 2—TCR-100 Video Cartridge Tape Machines (one first installed at Peabody studio)

1—Video IV Graphics Generating System

1—AVQ-10 Weather Radar System  
2—BC-100 Custom Audio Consoles

1—BCS-5000 Audio Intercom System

2—TT-25FL, 25 kW Lowband TV Transmitters (operating as Alternate-Main)

2—STL Microwave Systems

1—Mobile Radio System

1—Machine Delegation and Control System

This condensed listing does not include the numerous system components for control, monitoring, timing, in-house distribution, etc.

#### Technical Area Layout

The technical services space at TV-3 is on the ground floor. The area is divided by a hallway which controls access and minimizes unnecessary "through" traffic. On one side of the hallway are Studios A and B, each with a separate video production control room and an isolated audio production control room. Also located on this side of the hallway is a small audio-only production booth.

The opposite side of the hallway is highly visible through a floor-to-ceiling glass curtain. This large area includes the 18 equipment racks; Master Control console; Engineering office and work space; Video Tape Operations; Telecine, and a large storage room for current film and tape commercials.

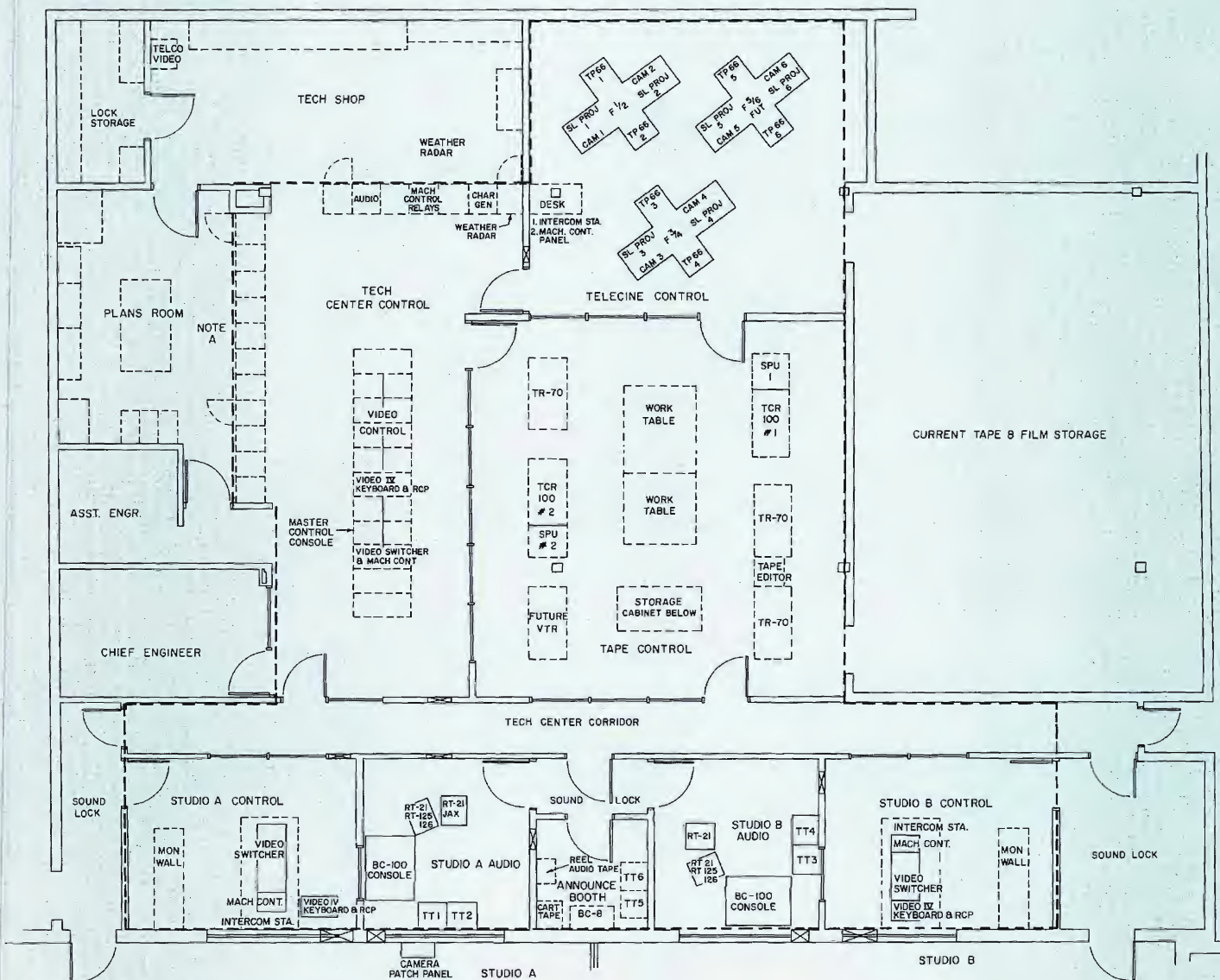
#### Master Control

At WREG-TV, the Master Control console extends for almost the width of the room, and is designed to double as a production position. A TS-70 System 200 (audio-follow-video) is used as the Master Control switcher. To the right of the switcher are audio cartridge playback units for handling audio announcements. To the left is a unique machine control panel for tape and telecine equipment.

In the center area of the console is the keyboard and remote control unit for the Video IV graphics generating system. Next to this is the video operator's position, with joystick controls for nine color cameras—five TK-45's and four TK-28's. The video control position is equipped with two matched color monitors, permitting two operators to ride controls, for two separate studio productions. A two-position interphone system at the video operator



Layout of TV-3 Technical Area.



NOTE A:  
ELEVEN EQUIPMENT RACKS FOR MICROWAVE AND TRANSMITTER MONITORING;  
LIVE CAMERA CONTROL UNITS; TERMINAL ASSEMBLIES FOR VIDEO DISTRIBUTION  
SWITCHERS; COMSYN; SYNC GENERATORS AND RELATED SYSTEMS.

TECH CENTER LAYOUT  
WREG-TV BROADCAST CENTER

position and at each production switcher allows for independent communication.

Behind the Master Control Console area is a row of eleven racks housing the monitoring and electronics for microwave, cameras and video switching and pulse and video distribution systems. Waveform monitors for the cameras are switchable, so one monitor can be used for adjusting two TK-45 cameras. Also installed here are the "match" switchers for the camera controls.

The 16 x 12 house monitoring switcher (audio-follow-video) is rack mounted. Another rack contains Comsync electronics, two TG-6 sync generators and a digital clock system.

Another row of seven equipment racks at right angles to the Master Control console serves as a wall, enclosing the engineering maintenance area. Mounted in these racks are audio system electronics; machine control relays; Video IV disk drives, circuitry, sync generators and encoders, and the equipments for the weather radar system.

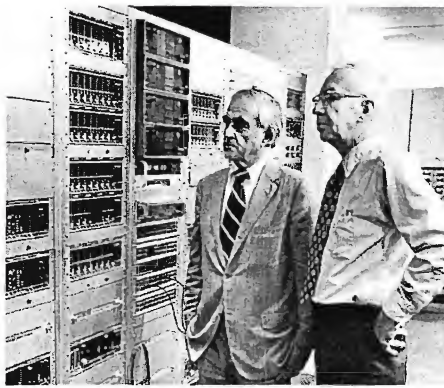
An RT-21 audio tape recorder is tied on a direct line to the U.S. Weather Service for recording weather announcements.

#### Video Tape Room

The Video Tape Operation at TV-3 is far roomier than most, and was designed with expansion space to handle future needs. All equipment has four feet of space behind it for ease of maintenance. Chief Engineer Leroy Knight notes that his experience plus the staff surveys of other broadcast stations pointed to the fact that tape rooms are characteristically extremely busy and cramped. He vowed to avoid this situation, and planned accordingly.

The tape machine complement is impressive to say the least. Along one side of the room is a line-up of two TR-70 VTR's; a Tape Editing/Programmer rack, and a TCR-100. The opposite side of the tape room is equipped with another TCR-100, and a TR-70, with space allotted for adding a second reel tape machine. Two large work tables are in the center space.

The TCR-100's are equipped with Random Home, EPIS (Electronic Program Identification System), editing facilities and separate signal processing units. Except for the traffic-heavy news



WREG-TV President Charles Brakefield and Chief Engineer Leroy Knight (right) in Master Control area.

slots, the video operator is able to load the cart machines for several breaks ahead. The TR-70's are used for dubbing and production assignments as well as for programming.

With two TCR-100's on-stream, WREG-TV is utilizing the cart machine



for production. The Random Home and editing accessories make the TCR-100 especially suited for production and program assembly.

At TV-3, the BIAS computer service handles billings, avails, log print-outs and other functions. All carts played on the two TCR-100's are assigned a number by the Traffic Department. This number is printed on the log, identifying the client, the specific commercial and its length. At present 600 carts are on file. For ready access and convenience in filing, tape commercial "master" reels are stored on shelves directly behind the dubbed cart.

#### Unique Machine Control System

An unusually flexible machine control system is employed at TV-3. Machine Control panels are located in Master Control, Studio A, Studio B and in

the Telecine room. The delegation system controls six TP-66 16mm film projectors, six TP-7 slide projectors, three TR-70 VTR's and two TCR-100 cart machines. The delegation is controlled locally at the machine. The delegation panel assigns Comsync as well as machine control. In this way, the system is always in sync whether assigned to Studio A, B, or to Master Control.

The Telecine area is equipped with four new TK-28 cameras. Two of these are inboard-mounted in each of two TP-55 Multiplexers. A third island, with a TK-27 and TK-22 was brought from the old studio. Each island can be split by the delegate system in a variety of combinations. The TP-66 projectors can be assigned to Master Control or to either of the studios as needed, as can the TP-7 slide projectors. Machine delegation is controlled by a panel on each film island. Tally lights at each of the three control panels give a positive indication of which location has control of each film output.

The tape delegation system gives control of any of the tape sources to Master Control or Studio A or B.

#### Audible Cue for Tape Machines

A useful device developed by one of the TV-3 engineers permits using cue tracks of the reel video tape machines to let the machine operators and the switcher operators know when five seconds of tape are left to roll. An audible tone sounds to alert the operators. Another tone comes on one second before the end of the tape.

The same cue arrangement is used with the TCR-100's, using the 8 MHz tone on the "cart" machine. This tone comes on at 10 seconds before EOT, triggering the TV-3 device and starting a clock which provides the 5-second and 1-second audible signal to the operators.

With the "cart" machines, the cue device only operates on the last event.

One of the solid state devices is used for each TCR-100. The sound is reproduced on a separate speaker at the location to which the machine is delegated.

#### Video Switching Systems

In planning the new technical facility, Leroy Knight says, we made sure that a lot of switching capability was built-in. And so it is. Three expanded-input





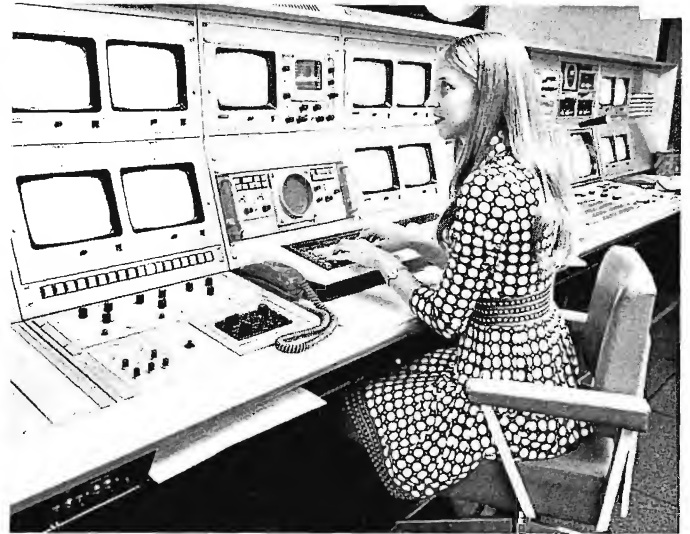
Cheerful, handsomely appointed conference room serves staff and clients (top). House monitoring system (right below) permits selecting for viewing any of the WREG video sources, plus the other local stations.

Spacious, tastefully decorated lobby welcomes TV-3 visitors.



The Master Control console is designed to double as a production position. Assistant Chief Engineer John Jackson shades cameras at far end of console. MC Switcher is in foreground, with Video IV character generator keyboard in center area.





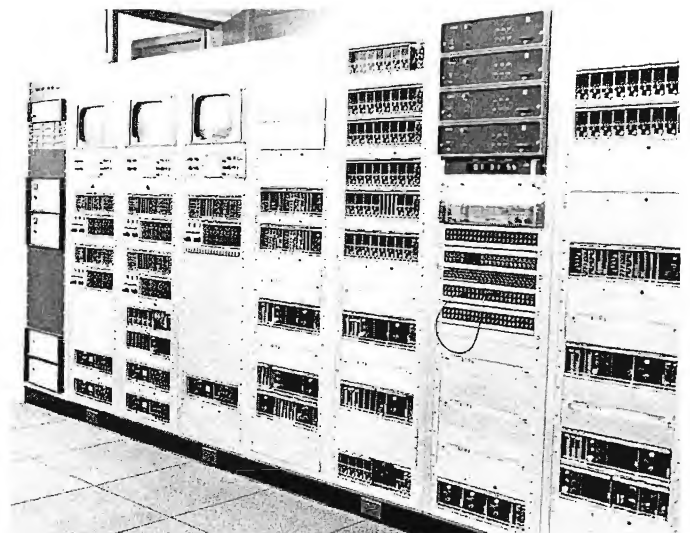
The Master Control switching position includes a unique machine control panel to left of operator. Delegation system controls six TP-66 and six TP-7 Projectors, three TR-70 VTR's and two TCR-100 cart machines.

Video IV Character Generator system keyboard and remote control unit are installed at Master Control console and in each of the Studio Production Control Rooms.

Video control is set up so that two positions can be manned to handle two separate productions simultaneously.



Racks behind Master Control console house the monitoring, control and electronics for microwave, cameras, video switching, Comsync and distribution systems.



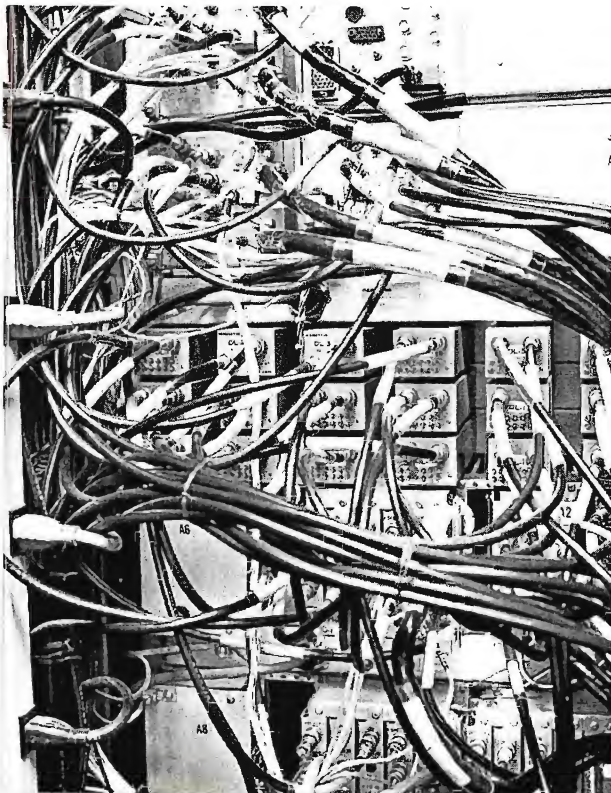


TS-70 video switchers provide ample capability as well as flexibility. The two production switchers (Studio A and B) have all video sources brought in as inputs (25); the Master Control switcher, having only one live camera input, is a 21-input switcher.

The Studio A switcher, a TS-70, System 360, is customized with full capability for varied production requirements, including three mixing and effects amplifiers and two special effects generators. Transition logic is utilized on the program/preset buses of this switcher. Studio B has the fixed sets for news, weather and the TV-3 daily morning program, "Good Morning From Memphis." The TS-70 production switcher used here is a System 160, utilizing two mixing and effects amplifiers and one special effects generator.

Master Control is equipped with a TS-70 System 200, audio-follow-video switcher. This switcher includes a single mixing and effects amplifier, with transition logic on the program/preset buses and one effects generator. The System 200 switcher is designed to handle the audio sources associated with the video inputs, in addition to eight separate audio-only sources. Independent level control of the "tied" and "untied" sources is included ahead of the mixer at the program amplifier. The system includes monitoring facilities for the "untied" sources before selection as a program source as well as facilities to monitor the program line.

Rack equipment was pre-assembled by RCA, with all wiring and connections identified on each end to facilitate installation and maintenance.



The switchers are set up for independent operation. However, for added flexibility, provision is made for Studio A and Studio B switcher outputs to go through the MC switcher (as another input). The switching systems also include Studio A entering Studio B without affecting any of the critical station timing.

Three additional special purpose switchers are rack-mounted in Master Control. One of these, an Emergency By-Pass Switcher provides back-up protection in case of failure of the Master Control switcher. This 10-input PMS-10 switcher by-passes the Master Control switcher to put the signal on-air. A second PMS-10 Switcher is used as a "back-feed" for sending any of the WREG-TV video sources to the CBS network.

The third system is a 16 x 12 audio/video routing switcher which is used for house monitoring, permitting selected offices in the building to punch up any source within the station, plus the other local channels. These offices are also equipped with cassette video tape recorders.

A Comsync distribution system with two TG-6 sync generators is installed, with two independent busses. This permits the station to operate from Master Control genlocked to network, while the studios can be operating separately on their own sync, independent of Master Control.

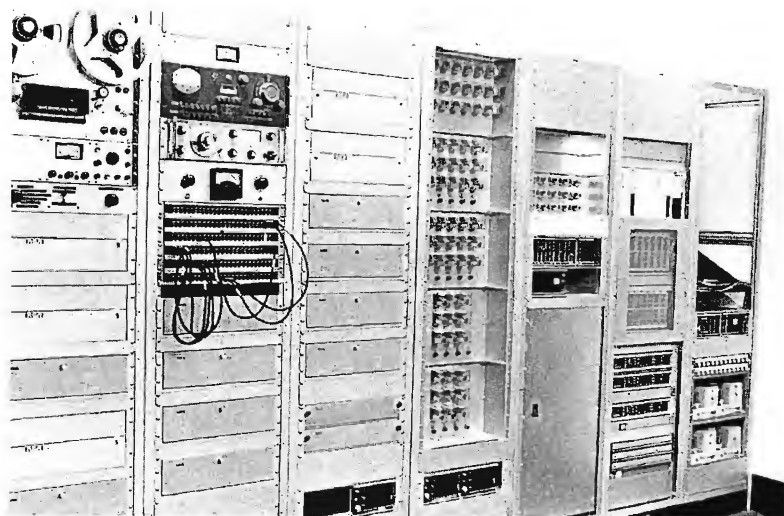
While not set up for computer operation at this time, Mr. Knight planned his switching systems to keep this option open for the future. All connections to the switchers, including machine controls, terminate in plugs which can be interfaced with the computer, should this be desired at a later date.

#### **Two Studios Plus Great Outdoor Sets**

The WREG-TV studios are set up for maximum flexibility. Studio A is 50' x 70', with cye and Chroma Key panel. Lighting is by Kleigl, controlled from a programmable console. Smaller studio B is 40' x 40', and uses fixed sets—one for news and weather; another for panel shows and interviews, and one for the daily TV-3 presentation, "Good Morning From Memphis".

Five TK-45 cameras are employed, three assigned to studio B, and two for Studio A. This is not a rigid arrangement, however, since a patch panel located outside the Studio A control

This row of racks houses audio system electronics, machine control system relays, Video IV circuitry, encoders, and disk drives.



Weather radar scan is integrated with TV-3 weather reports.



room permits all five cameras to be set up in either studio—or out doors.

Two camera connectors are located under a bench on the outdoor terrace. From here, the bustling Mississippi River serves as a scenic backdrop. This attractive setting is frequently used for originating live portions of the "Good Morning From Memphis" show.

#### **Versatile Video IV Graphics System**

The Video IV character generator system is installed in the Master Control area, with keyboards and Remote Control Panels located at MC; in Studio A and B Production Control rooms. It is a three-channel system, permitting each control room—MC, Studios A and B—to operate its own channel, independent of the others. Or, all three channels can be operated from one location. All locations have access to the two disk drives, with provision made for "locking out", so that if the disk is in use by one channel, others cannot access it.

Cal Crowell, Production Manager for WREG-TV is enthusiastic about the Video IV system and is constantly coming up with new uses for the system—for both program and commercial production. The variety of font styles, plus the range of graphics that can be developed open up new possibilities for production. The station is making good use of the ability of the system to produce many kinds of graphics directly from the keyboard. One of Mr. Crowell's creations is a replica of the American flag generated on the system. He says it is easy to make, and very useful. Any material created on the keyboard can be stored on a floppy disk memory for repeat use on demand. For example, TV-3 repeats a weather graph daily, with updated information. Each bar—temperature, humidity, barometer, wind—is displayed with a different color.

*(More details on the Video IV system are covered in a separate article in this issue of BROADCAST NEWS.)*

#### **Turnkey Installation**

One aspect of the WREG-TV contract which was particularly gratifying for RCA was the opportunity to contribute to the system planning and layout and to follow through with the total system assembly, installation and checkout.

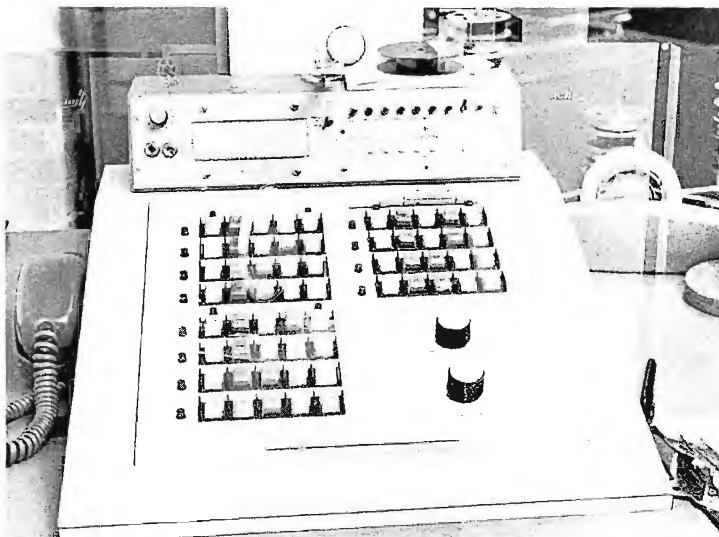
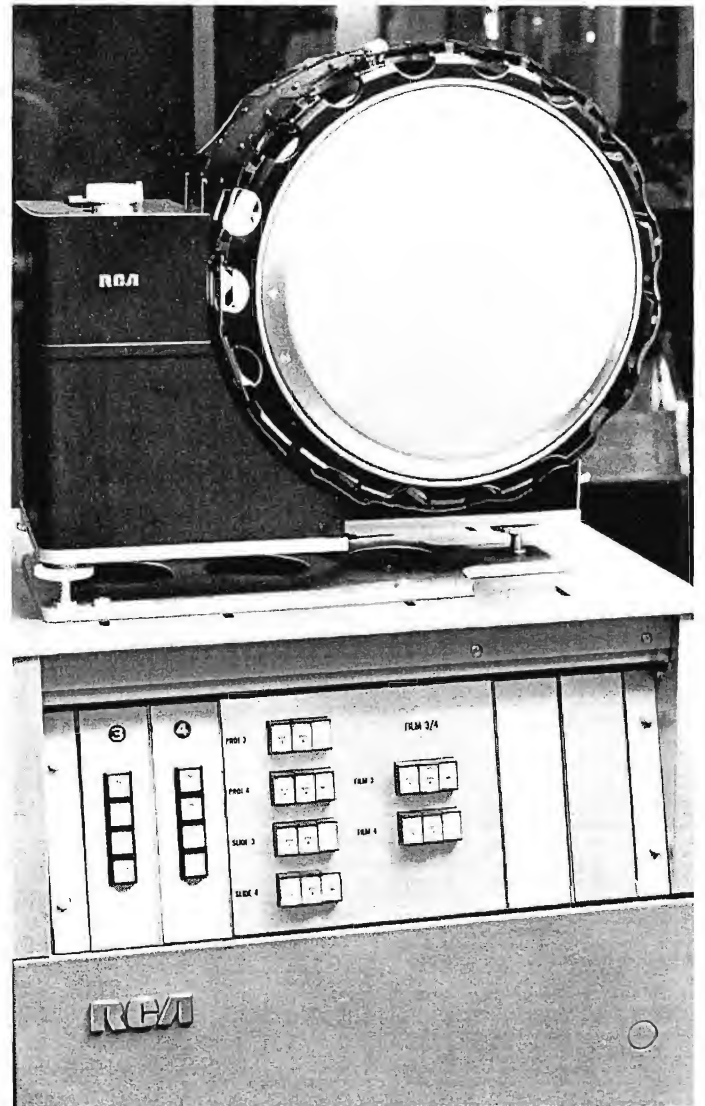
The system was completely assembled and tested at the RCA CRAE (Custom, Repair and Engineering) shop located near the Company's Camden, N. J. plant. All video and audio racks were pre-wired, with all wiring clearly labeled at each termination, and complete drawings were supplied. Architect's drawings identified the exact location of all racks and equipment.

This floor layout was duplicated in the CRAE shop, making it much easier for the customer to relate to the equipment when checking on progress. Later, when the completed assemblies were shipped via vans to the new building on the Memphis waterfront, the locations of each piece were





Adjoining Master Control is the Video Tape Room, with its complement of three TR-70's, editing facilities, and two TCR-100 cart machines.



Machine control system provides for local or delegated control of film and tape sources. Control panels are located in Master Control, Telecine, and in the Studio A and B Control Rooms. Delegation is controlled locally, with tally lights indicating delegation status of each machine.

Among the outstanding assets of TV-3 is a film library that rivals those of the networks. Literally thousands of film titles have been acquired over the years and are used to supplement network and locally-produced programming.





marked on the floor. The equipment was unloaded, ready for hookup, saving much on-site installation time.

One of the advantages of having the system pre-wired, according to Mr. Knight, is that cable runs have been carefully planned so that no cable is more than 110 feet long. For exact system timing, some delay lines were installed.

Computer type flooring is used throughout the technical area. This provides easy access to wiring, as well as a convenient storage facility for small parts. The computer flooring also permits the use of a halogen gas fire protection system which has proved to be quite effective, Mr. Knight says. Smoke sensors in the system cause the gas to be released under the floor, smothering the fire, without damaging equipment or having ill effects on personnel.

#### **Engineering/Production Staff Functions**

For WREG-TV, the turnkey contract permitted effective utilization of their engineering staff, since the station had to maintain normal broadcast operations while preparing the new facility.

The 13-man technical staff at TV-3 includes Chief Engineer Leroy Knight; Assistant Chief John Jackson; seven studio engineers and a four-man transmitter team.

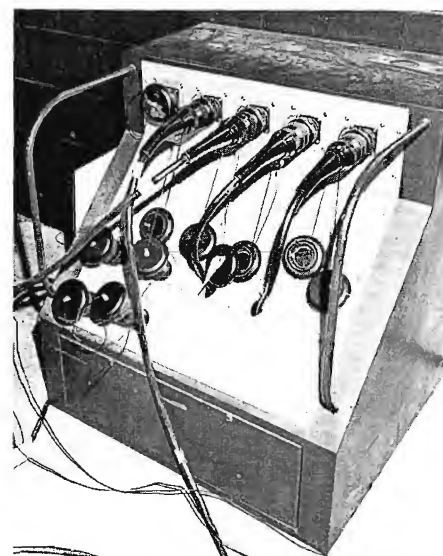
Engineering personnel handle maintenance and technical operations such as camera set-up and shading. Cal Crowell's Production Department is responsible for manning the switching positions in Master Control and in Studio A and B Control rooms, and for operating the audio boards. His staff also functions as telecine operators and camera-persons. The same staff handles such production-associated assignments as producers; directors; lighting; graphics.

#### **Changeover: Sign-Off/Sign-On**

Changeover from the old broadcasting facility in the Peabody Hotel to the new location took place at 12:15 A.M., March 2, 1975. TV-3 signed off the air for the last time with its old call letters of WREC-TV. Just 45 minutes later, WREG-TV signed on from its spanking new broadcasting center on the banks of the Mississippi River.

Through-the-window photograph shows Studio B control room, with studio, TK-45 camera and "Good Morning From Memphis" set in background.





Each studio has a separate audio control room, with audio reel-to-reel and cartridge recorders and a custom BC-100 audio control console.

Camera patch panel provides flexibility for assigning cameras to various locations, indoors or out.



For outdoor camera shots, a camera connector panel mounted under a bench on the terrace permits fast set-up.



Studio A control room, with Video IV Keyboards and Remote Control Unit mounted in a mobile console with monitors.





WREG-TV Production Manager Cal Crowell makes effective use of the graphics capabilities of the Video IV character generator system as a production aid.

The move was carefully orchestrated, with the new studio equipment already in place and checked out. The STL microwave path had been calculated and the reflector dish on the tower at the new location was precisely aligned. As the midnight sign-off was being made, a rigger was mounting TV-3's antenna tower to the 450 foot level to change the orientation of the microwave relay reflectors.

The station's two-way radio system was used to facilitate the final positioning of the reflectors for optimum picture quality. A four-degree change in the orientation of the microwave reflector was required for the changeover.

In addition to the new studio operation, WREG-TV also changed its transmitting plant, with the installation of two new 25 kW lowband transmitters. The twin TT-25FL systems were installed in the old transmitter building while the veteran 19-year old TT-10/25BL transmitter continued on-air. This was the original transmitter for TV-3, installed in 1955 and going on-air January 1, 1956.

#### Alternate-Main Operation

The two TT-25FL systems are now operating on an Alternate-Main basis, with the change-over taking place on Sunday evening. Aside from the sharp picture and excellent color from the new transmitters, Mr. Knight believes the dual transmitting system is a cost-effective operating arrangement. It permits scheduling maintenance as a routine operating procedure; provides ample back-up protection against outages, and is ideally suited for the 24-hour broadcast day which is becoming

ever-more prevalent in the industry. TV-3 is now On-Air for 20 hours daily. Extending to 24-hours would not pose a difficult programming problem, with the extensive movie library owned by the station.

Installing the new TV transmitters in the same building with the operating TT-10/25BL system was handled with extreme care. The two new TT-25FL 25 kW transmitters were moved in and hooked up in a temporary location, with the amplifier and control cabinets on rollers. The new systems were checked out and operated into dummy loads while the old transmitter continued on-air.

Proof-of-performance tests were made, and temporary FCC authorization was obtained to switch to the new transmitters (which are designated as #1 and #2).

When Transmitter #1 went on-air, the old transmitter was immediately dismantled and removed. Transmitter #2 was rolled into its final position and re-wired. The following week, #2 became the on-air transmitter, and system #1 was rolled alongside and wired in. The entire transmitting plant shift was handled by the four-man TV-3 transmitter staff.

#### Redundant Systems

Redundancy was an important consideration in planning the new WREG-TV broadcast center. Back-up and dual systems in the studio and at the transmitter minimize the possibility of lost air time. The back-up functions also cover building power and air requirements.

Two different circuits are used to provide the 750 KVA of power required by the station. This redundant arrangement includes an automatic changeover in two seconds in the event of a power failure in one of the circuits. Air conditioning the new building is no small task. Duplicate systems are installed, each with a 260 ton capacity. One of these cold-water systems is adequate for the needs of the building.

Dual air compressors for the tape equipment are located in the same room with the air conditioning systems.

#### An Envious Record

When TV-3 went on-air January 1, 1956, it was the third station in the Memphis market. One month later, when ratings were issued, the new station received the top rating—which

has not been relinquished since. WREG-TV President Charles Brakefield remarks that the station has been a consistent leader, with a current 38 to 41 share of audience and top Nielsen ratings from 9 A.M. to midnight.

From the beginning, the station has been maintained in top technical condition, notes Mr. Brakefield, which contributes to audience ratings. And, he adds, when the picture on the home TV set is sharp and shows popular network programs plus equally appealing locally produced news, public affairs and special programs, the natural result is dominance of the market.

"Serving the community has always been a hallmark of this operation", Mr. Brakefield emphasizes, "and the New York Times management demonstrated their willingness to invest in this community by approving the budget to build our new broadcast center."

For WREG-TV, the investment in a new plant is a continuation of the station's long-standing accent on technical excellence. Further, it anticipates the additional revenue potential from expanding local requirements for television production services. Clients and talent are rapidly becoming acquainted with the production possibilities and efficiency of the new studio facilities.

Perhaps less tangible, but equally important, TV-3 employees enjoy and appreciate the pleasant inside working environment as well as the attractive riverfront setting.

#### How WREC-TV Became WREG-TV

The remarkable story of WREC and its founder Hoyt B. Wooten are chronicled in a fascinating commemorative book "Sign-On—The First Fifty Years of WREC Radio".

In brief, the WREC-AM call letters have been carried over Memphis airwaves since 1926. TV signed on January 1956, and FM was added in 1967.

In 1962, the WREC stations were sold to Cowles Communications, Inc. WREC-TV was sold to the New York Times Broadcasting Service in 1972, with Cowles devoting full attention to the WREC-AM and FM radio properties. With different ownership for the television and radio operations, a change in call letters was necessary. Since the WREC radio call letters took precedence, the TV-3 call letters were changed in 1975 to WREG-TV.

# WBEN, BUFFALO

## upgrades with new remote controlled TV and FM transmitting systems

**W**HEN Frank Maser, Director of Engineering for WBEN-TV, came to Buffalo some eight years ago, the move presented a challenge and an opportunity. Ch-4, long established in the market, was ready for a complete refurbishing of its technical facilities.

One of Mr. Maser's first tasks was to develop a master plan for upgrading. First the studio area was rebuilt, with new cameras, tape, terminal equipment, master control and production control facilities. With Buffalo adding major league franchises in football, basketball and hockey, Ch-4 invested in a new mobile unit with an on-board complement of six TK-44 color cameras; two video tape machines, switching and audio and slow motion disc equipment.

### Automated FM and TV Transmitters

Completing the initial master updating plan was the installation of automated transmitters for FM and TV. With this investment of nearly a million dollars, WBEN-TV and FM has one of the most versatile, sophisticated transmitting plants in the industry. Both the FM and TV transmitting systems are remote-controlled from the studio. Full redundancy in circuitry; remote control; STL; power; and transmitter functions provide maximum protection against lost air time while permitting maintenance on a routine basis.

The TV transmitter is a TT-30FL 30 kW parallel VHF system with bi-level power switching capability. FM stereo operation, 24-hours a day, is handled by twin 40 kW BTF-40E1 transmitters which are fully automated, including automatic power level control. The FM system includes a new BFG-8 circularly polarized antenna with de-icers.

### An Unusual Transmitter Environment

The transmitters are housed in a attractive brick building in Colden, N. Y., some 30 air miles from the studio. Here the environment is a far cry from the "plain piperack" cinder-block surroundings common to most transmitter sites. WBEN's new transmitters are built-in, framed by handsome walnut paneling, with a dropped ceiling and recessed lighting. The only "extra" missing is a rug for the floor, and Frank Maser has this scheduled for the near future.

Transmitters and related rack equipment occupy three sides of the room, in an impressive array. Along one wall is the TT-30FL, with the two BTF-40E1 FM transmitters filling the other two walls. The entire transmitting plant is replete with fail-safe protection to maintain on-air operation, while preventing system malfunctions.

A dual microwave system is installed for TV, with automatic switching and self-selection. One system is transmitting while the second is on hot standby.

In the event of a failure or signal deterioration on the operating system, the standby is automatically switched on to maintain picture integrity. If there is a fault in a microwave receiver or transmitter at the transmitter site, the fault indication is sent back to the studio and displayed on the remote control system, with a red light showing which unit is in trouble. This permits alerting the Transmitter Supervisor quickly so he can take appropriate action.

### Inverter System

Another safety feature is an inverter system at the transmitter which operates from a 24-volt battery supply and provides emergency power to the mi-

crowave receivers. This provides for remote control from the studio even in the event of a total power failure at the transmitter site.

Two inverters are used, with the second unit available for back-up. A manual switch permits selecting either inverter for use. This system also provides power for the BTR-30 Remote Control System, and prevents the BTR-30 from stepping—getting out of sync with the studio remote control system—when power is removed and re-applied. The inverter system also supplies emergency power for the precise frequency control system which maintains the station's visual frequency.

Among the monitoring devices used in the Ch-4 transmitter operation is a push-button panel which was designed and built by Transmitter-man Stan Feld. This time-saving push-button coaxial relay panel is used for checking monitoring points along the video path. It is used for routine checks and for proof of performance tests, making it quick and easy to isolate problem areas without the need for using the scope and test equipment.

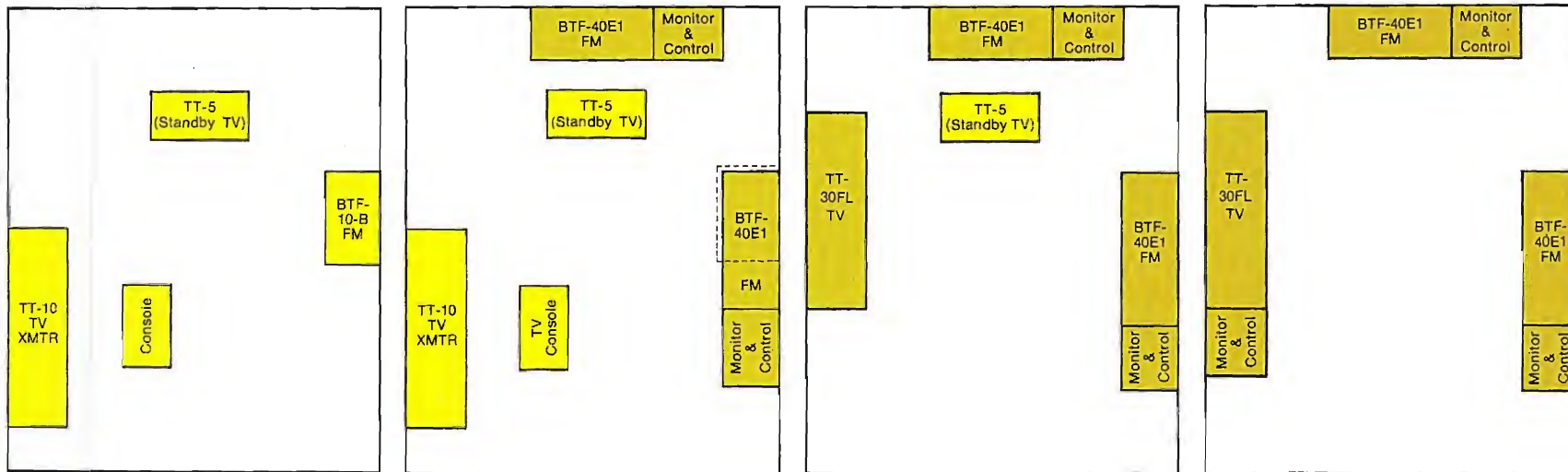
Typical of the care taken by Ch-4 to make the system safer and easier to maintain, each rack in the remote control and monitoring system has a separate AC electronic regulator to maintain proper line voltage. The regulator can be by-passed if necessary.

### More Fail-Safe Protection

A fail-safe protection system, BRF-1, is tied-in to both sides of the TT-30FL Transmitter. In the event of a critical metering failure indication, the fail-safe system shuts the transmitter down one hour after indication of metering failure. Indicator lights at the studio advise



## Four-phase Transition of WBEN Transmitting Plant

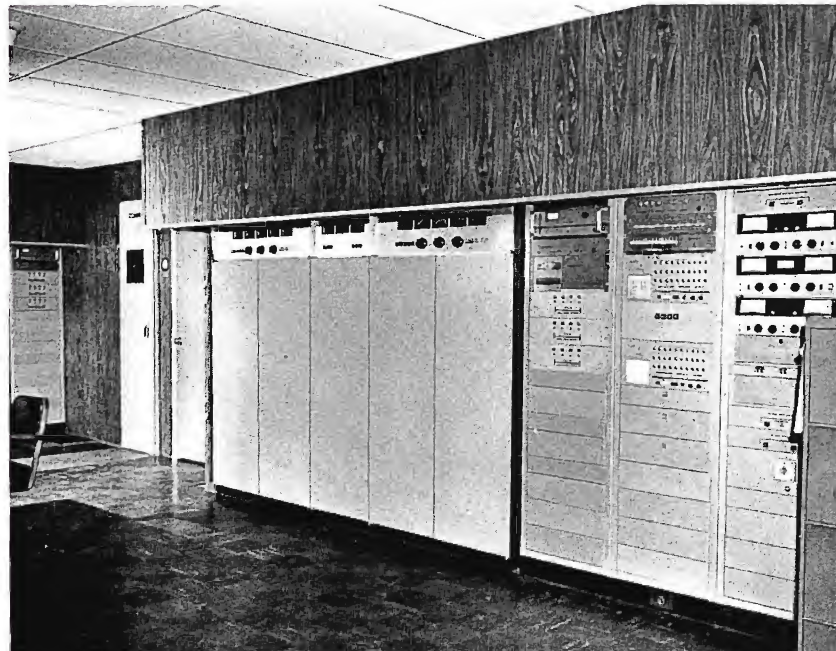


1. Layout of the WBEN Colden, N. Y. transmitting plant before new FM and TV transmitters were installed.
2. The two 40 kW BTF-40E1 FM transmitters were installed in 1973, with the first new system assembled behind the TT-5 standby TV transmitter. When this system was operational, the BTF-10B was dismantled and the second BTF-40E1 system installed in its place.
3. The TV transmitter changeover was made in 1974. The control cabinet and one 15 kW side of the TT-30FL transmitter were wired in place and made operational. The TT-10 and its console were removed to make room for the second 15 kW side of the new transmitter and the new control and monitoring equipment.
4. With the new 30 kW parallel system fully operational, the 27-year old TT-5 which had been the standby was removed.

Walnut paneling frames WBEN's TT-30FL transmitter and its related monitoring and control racks. At the right rear is a part of one of the station's twin 40 kW FM transmitters.



On the wall opposite to the TT-30FL TV transmitter is the second built-in BTF-40E1, 40 kW FM transmitter, with remote control and monitoring racks.





Jerry Klabunde, Technical Director, WBEN-FM/AM is shown in the AM studio with the unusual remote control arrangement which he devised. Just above the console is a U-shaped unit housing all remote control equipment. A winch, controlled by a switch on the console, raises and lowers the unit to a convenient height.

Stan Feld (left, bottom) points out the push-button coaxial relay panel used by Ch-4 for checking monitoring points along the video path. WBEN Chief Engineer Frank Maser is at right.

them that the transmitter shutdown will occur. This allows time to get a man to the transmitter site to check the problem. The key metering functions on the BRF-1 protection system are: Aural Plate Voltage; Aural Plate Current; Aural Power Output, and Visual Power Output.

In the event that the remote control command signal from the studio is lost, there is a 20-second lapse, after which both transmitters shut down automatically. Once the command signal is restored, both transmitter sides come back on automatically. Every week the

remote control metering systems at the studio and the transmitter are calibrated.

A Tolerance Alarm System provides periodic read-outs of ten transmitter control functions which are logged automatically at ten-minute intervals on the ADP-220 Automatic Data Printer at the studio Master Control. If any of the functions are out of prescribed tolerance parameters, an alarm sounds at both the studio and the transmitter site. At the studio, the ADP-220 logging system prints the out of tolerance reading in red.

#### TT-30FL: A Flexible System

The TT-30FL system provides Ch-4 with the flexibility of operation to handle virtually every contingency. Normally the two 15-kilowatt sections of the transmitter are operated in parallel, delivering an easy 10 kW visual output to provide the station's authorized 100 kW visual and 20 kW aural ERP. The OPTO-Switcher permits using one of the 15 kilowatt sections alone without need for retuning as the various paths through the OPTO-Switcher have been impedance optimized. And with the Bi-Level power switching option, one side of the transmitter operates at full power while the other side is down for maintenance. Less than three seconds are needed to switch from parallel operation to one-side operation at full power. This arrangement permits operating the system on a Main-Alternate Main basis if desired.

The new transmitting system has excellent stability, according to Mr. Feld, with very little drift.

The visual power level is normally maintained at 100% by the use of an Automatic Sync Level Control.

#### Transmitter Transition

Ch-4 began operations in May 1948 from the Statler Hilton Hotel in downtown Buffalo, with an RCA TT-5A, 5 kW transmitter. In 1953 there was a major upgrading, and the transmitter and antenna site were moved to the present location at Colden, N. Y. A new TT-10, 10 kW transmitter was installed in the new building, and the TT-5A was brought in from the Statler

for use as a back-up. When this long-running performer was finally removed in September 1974, the total elapsed filament time on the visual was 147,736 hours.

Along with the TT-10, a new TV antenna, a 14-bay super-gain antenna, was mounted on the four sides of the new tower and near the top of it. This antenna is still in service.

The FM transmitter originally installed at the new site was a BTF-10B which has now been replaced with the twin 40 kW FM transmitting plants.

#### New Transmitters Fit Into Old Layout

Installation of the new TV and FM transmitters required painstaking care, since the plan was for the new transmitters to fit into the same "U" configuration as the replaced systems.

The first BTF-40E1 40 kW FM transmitter was installed in position directly behind the old TT-5 TV transmitter which had been in standby service for a number of years. The new FM transmitter was wired in place and made operational. During this time, the old BTF-10B, 10 kW FM transmitter was on-air, with an even older 3 kW transmitter serving as back-up. With one new BTF-40E1 going on air the end of November, 1973, the BTF-10B and the 3 kW standby transmitter were dismantled and removed. The second BTF-40E1 parallel system was then installed.

RCA Project Implementation personnel were on hand to supervise and assist with the installation.

#### First TV Transmitter On-Air September 1974

With the completion of the FM transmitting system and antenna installation, the TV transmitters changeover proceeded, starting with the delivery of the TT-30FL transmitter to Colden in August 1974.

By September 3, 1974, the control cabinet and the 15 kW "B" side of the TT-30FL system had been wired and tested, and the new system was put on-air. The TV transmitter system contract included participation by an RCA Project Implementation Team in sys-



tem design, component wiring and assembly, and on-site installation supervision. The TV monitoring, microwave and control racks had been pre-wired by RCA at their CRAE (Custom, Repair and Engineering) shop located near the Camden plant. This resulted in substantial time and manpower savings in completing the transmitter installation.

Included in the TT-30FL system was an OPTO-Switcher that provides an optimized rf path for each operating mode. This was also factory-tuned by RCA to eliminate the need for making these critical adjustments during installation.

#### **October 1, 1974—TV Transmitter System Complete**

With the "B" transmitter on-air, the TT-10, 10 kW system which had been in service for more than 22 years, was removed and the "A" side of the new transmitter was wired in place. With both sides of the TT-30FL system operational, the TT-5 veteran of 27 years was permanently retired.

Completing the TV transmitter installation was a touchy business, since WBEN-TV broadcasts for 21 hours a day, and the installation had to be accomplished with no loss of air time. In the final stages, the working period was limited to the three or four early morning hours between sign-off and sign-on. The total system was completed on October 1, 1974.

#### **Chart Recorders Monitor 20 Events**

Since the transmitter site is manned only during weekdays, there is a need to know what might have happened at night or during the weekend which could affect transmitter operation.

To meet this need, Stan Feld has installed two rack-mounted paper tape event recorders, each of which can monitor up to ten events. Events to be monitored are programmed into the recorders. Fifteen of the monitored events are standard, with five additional events selectable for programming into the system.

It can record such data as inside temperature; de-hydrator operation; when the emergency generator started; time of power failure; how long generator

power was on. Even lightning hits on the tower can be recorded.

The charts give a time reading and record normal and unusual readings for interpretation. The recorders normally move at a rate of .8 inches per hour. For better resolution, the system can be set up to run at six times the normal rate.

#### **Automatic Power Transfer**

Among the numerous safety systems in the WBEN transmitter plant operation is an Automatic Power Transfer Switch. Should there be a power failure or a 10 percent drop in voltage, the AC transfer switch starts the emergency generator and transfers power to the generator automatically in ten seconds. If utility power is restored to normal, the system senses the power condition for five minutes. After five minutes of normal utility power levels, the AC transfer switch shifts the system from the generator back to utility power.

The generator runs for an additional five minutes to cool down, then shuts off and is ready for use again. The power system in the transmitter building has an 800 Amp capacity with 500 Amps currently being used.

#### **Power**

Incoming power is routed from a distribution panel through power regulators at each of the transmitters. One power regulator handles the TT-30FL transmitter. For the FM transmitters, each 20 kW side has its own power supply and regulator. This protective system prevents any sudden drops or surges of power which could effect power output levels, and permits maintaining automatic power controls at desired levels.

Emergency power is supplied by Caterpillar diesel which can generate 195 KVA of power—enough to operate both the TV and FM transmitters as well as the air handling system. The emergency generator has a pre-heated fuel source and electric jacket heaters which maintain engine temperature at 100-110°F. A bank of batteries on continuous charge is used to start the generator.

#### **Transmitters Individually Ducted**

An interesting facet of this large trans-

mitter installation is that the exhaust air from each transmitter is individually ducted to the outside. For heating economy in winter, an exhaust air control system senses inside temperature and diverts heat from the transmitter ducts into the building. The heated air is processed through the air handling system and is re-circulated in the building. A low pressure steam and hot water system is used for heating the building.

For air conditioning the building, a dual compressor system is used for cooling, each with a 15-ton capacity. Positive air pressure is maintained inside the building, minimizing dust problems. The air circulating system operates at all times.

#### **FM Transmitting Systems**

The FM transmitters operate as Alternate Main systems. Two 20 kW transmitters are combined in each system for a 40 kW output. This arrangement provides ample protection against transmitter outages. For example, if the on-air transmitter senses a fault or experiences two overloads, the custom logic system will automatically start the other transmitter. After a three-minute warm-up period, the standby transmitter operates into dummy load. At this point, both transmitters shut down momentarily while the antenna transfer switch transfers the off-air transmitter output to the antenna and the on-air system to dummy load. After six minutes, the dummy load shuts off, and so does the disabled transmitter. This transfer can be made either automatically or manually, and requires only five seconds.

The individual monitoring systems for the transmitters also switch automatically with the transmitter changeover.

#### **Entire FM Transmitting System Is Automatic**

The FM transmitting system was specified by Jerry Klabunde, Technical Director for WBEN-AM/FM. Youthful, but experienced, Mr. Klabunde has a solid background in transmitter design and operation, having been involved with million-watt (not ERP) systems for the Voice of America, and high power transmitters at Continental Elec-

tronics before shifting to WBEN with a mandate to modernize their radio facilities.

In discussing with management the options for handling their FM power and performance needs, the choice narrowed to either using three 20 kW transmitters, with two operating and third on standby—or going to two complete 40 kW systems. The latter option was selected by station management.

A custom logic system used with the automatic functions of the FM transmitters was designed by RCA to Mr. Klabunde's specifications. The logic interface equipment was built by the WBEN radio technical staff, and operates on 24 volts, another safety feature of the system.

According to Mr. Klabunde, the entire transmitting plant is automatic. All modulation monitors and status alarm indicators follow the automatic circuitry, but with manual override capability. Everything at the transmitter site can be operated from the studio—even the dummy load can be turned on remotely.

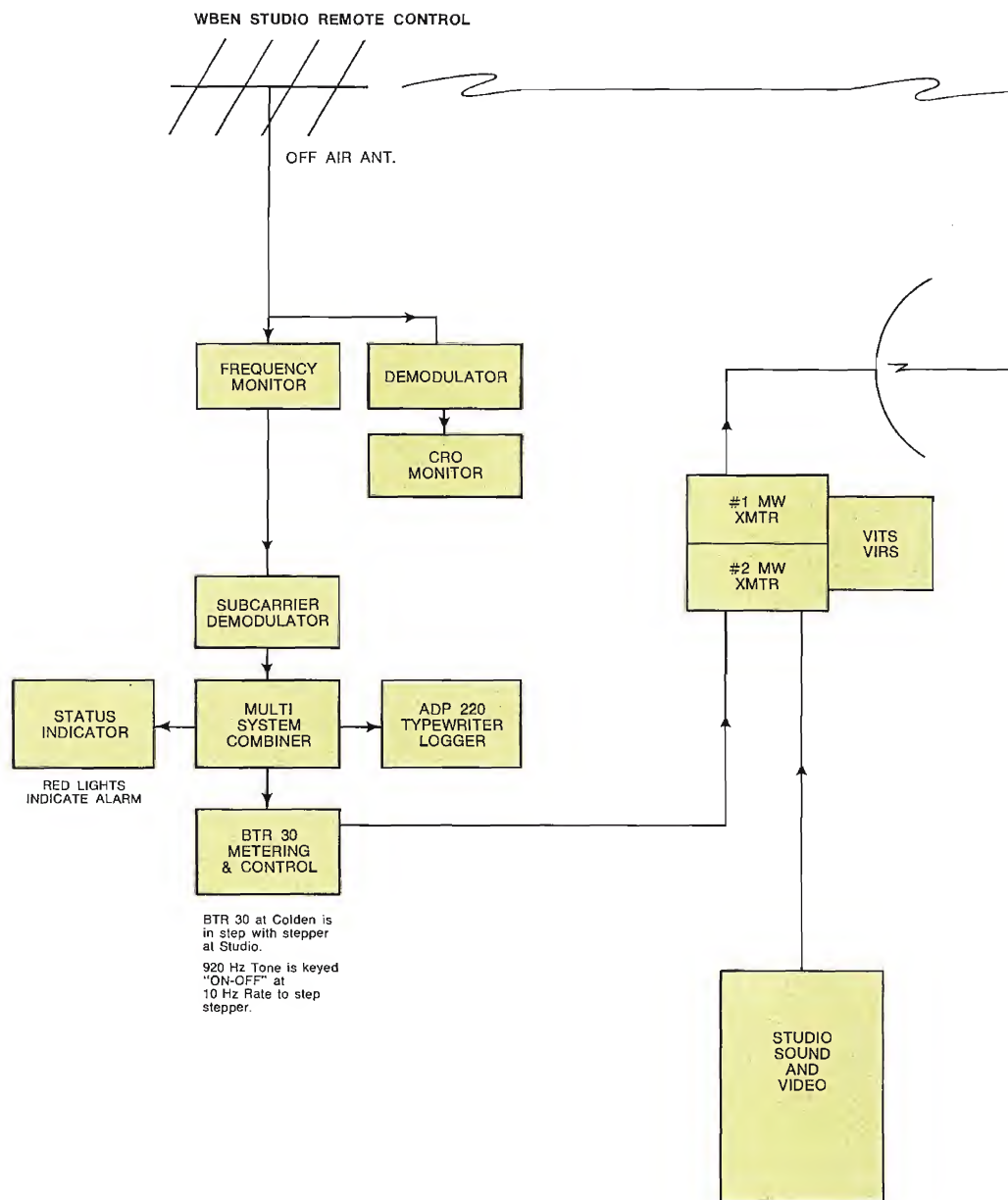
#### Redundant Microwave and Remote Control Systems

Two microwave transmitting and receiving systems are used for the FM signal, and a land line is used for handling the telemetry functions. Even the FM Remote Control System is redundant, with two BTR-30's hardwired into the monitor rack at the transmitter. One BTR-30 is mounted in the studio, with a back-up unit on hand there, ready for quick hook-up. The FM transmitters are switched on a weekly basis.

#### Automatic Power Control

For operation in Buffalo, it was only natural that the BFG circularly polarized antenna is equipped with deicers. A deicer read-out indicator at the power distribution panel gives a visual indication of the deicer conditions, such as if there is a failure or problem.

The BFG antenna deicer circuit is



This simplified diagram was prepared by Stan Feld as a guide for the WBEN-TV studio staff to aid in their understanding of the TV transmitter remote control operation. A complete instruction manual was also developed to make it easier for studio technicians to handle necessary remote control operations, such as switching over from one transmitter to the other.

equipped with temperature sensors to determine when the deicers should be turned on. The de-icer current meters read the deicing current for the four bottom bays and for the four top bays, and the total current for all eight.

The FM transmitters are equipped with Automatic Power Control which maintains power at 100 percent. The control senses any change in transmitter output to the antenna and adjusts power up or down to maintain within two percent of licensed operating power.

Sensing diodes for the meters on the FM transmitters were removed from inside the cabinets and mounted externally on the wall where temperature is more constant.

WBEN-FM, "Rock 102", operates automated, 24 hours a day. For more than a year now, the programming has been a popular rock format aimed at the young adult audience. It has proved to be most successful in the Buffalo market and has attracted a large audience in neighboring Canada, particu-



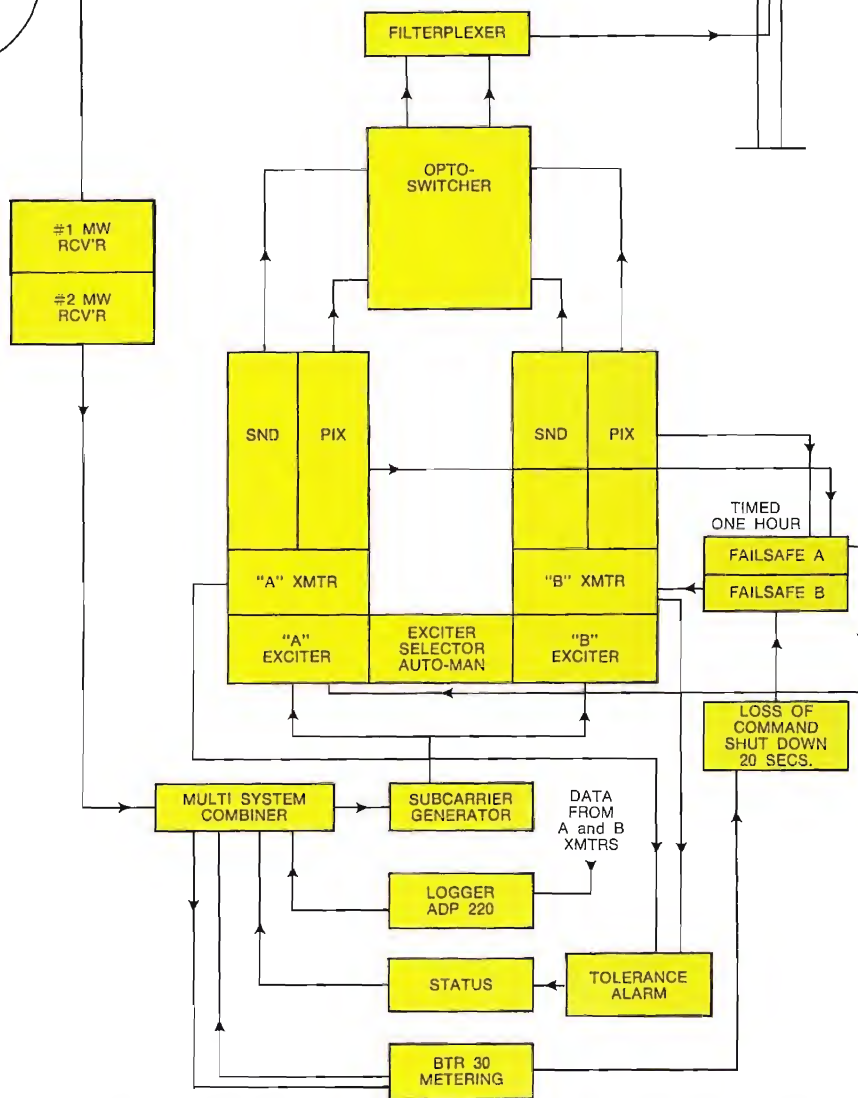
## COLDEN TRANSMITTER

The main TV sound carrier is modulated by a 39 kHz subcarrier which is frequency modulated by:

1. BTR-30 at the transmitter supplies data on a 1280 Hz tone which is AM modulated by a tone which varies from 22 Hz to 36 Hz.
2. Typewriter logger information is sent via FSK (frequency shift key). 1600 Hz-1800 Hz tone.
3. Status information is sent via 2700 Hz tone which FSK to 2300-2500 Hz. If for any reason there is a 39 kHz subcarrier failure or failure of the 1280 Hz tone at the transmitter or at the studio receiver, the studio BTR-30 will transmit a 577.5 Hz tone which will shut down the transmitter after one hour, unless corrective measures are taken. All of this information is sent simultaneously. Each transmitter sends four additional channels of data to the Fail-Safe units, any of which will initiate the one-hour Fail-Safe timer. These data channels are:

Aural Plate Voltage  
Aural Plate Current  
Aural Power  
Visual Power

6.8 MHz subcarrier from studio, modulated by 920 Hz tone. 920 Hz tone can be modulated by 790 Hz tone for raise or by 670 Hz tone for lower. Loss of 920 Hz tone is loss of command and would shut down TV transmitter after 20-seconds delay. Carrier is restored when command is restored.



lary Toronto, Mr. Klabunde says.

In addition to the substantial antenna/transmitting system investment, Mr. Klabunde has been responsible for completely re-vamping the studio facilities. For FM, a 20-channel computerized automation system was installed. The radio operation is heavily involved in audio production work, both at the studio and on remotes, and has excellent facilities, including six new sophisticated audio consoles, some of which are also computerized. Consoles

have better than 16 channels, and some are used for on-air and production.

### An On-Going Program to Keep Pace

With the completion of the comprehensive automated TV and FM transmitting plants; the addition of a fully-equipped mobile unit and the previously accomplished upgrading of the studio and tape facilities, it could easily be assumed that WBEN management might slacken off on capital expenditures for the immediate future.

Such, however, is not the case. Frank Maser is already into a new phase of the on-going master plan, looking ahead to more changes in the studio technical plant to further improve operating efficiency.

One assumption can be safely made: with the new automated transmitting systems installed at Colden by WBEN, this key area of broadcast operations should be set for many years of efficient service. That's the way it was planned.

□ TK-76 is a highly specialized camera which should be of interest to most broadcasters and production organizations. Successful integration of portable video color cameras into news telecasting and related activities promises to produce substantial user reward. TK-76 camera design, totally new, reinforces this promise.

#### 16mm Film Cameras Studied in Developing TK-76

Cine cameras for 16mm film have been developed over many years. Their designs have evolved into compact, maneuverable, lightweight yet rugged units which are currently used for most TV newsrooms and by many production houses. Therefore, the 16mm film camera was closely scrutinized as a starting point for a TV news gathering camera. For instance, total TV camera weight closely approaches that of popular 16mm cine units. The camera is compact, has a low profile, and is well balanced when on the operator's shoulder. The camera, too, is versatile with respect to power supply and mounting provisions, and is an integrated package, highly automatic and thus simple to operate.

TK-76 is a portable video color camera that closely resembles cine camera design in important features.






#### TK-76 Handles Like A Film Camera

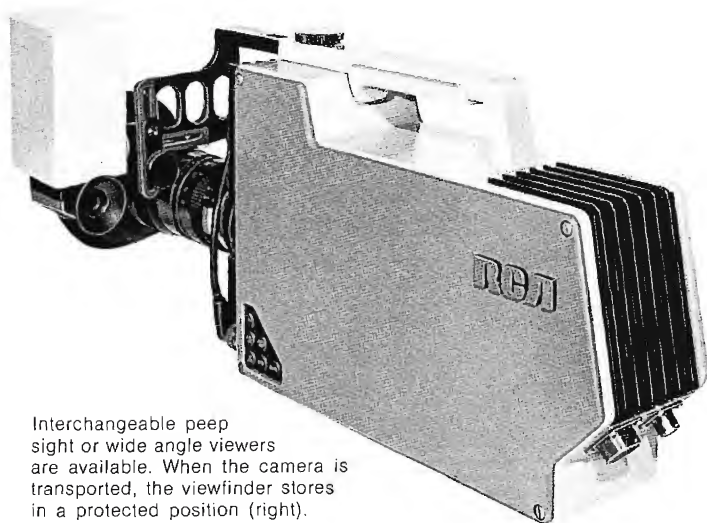
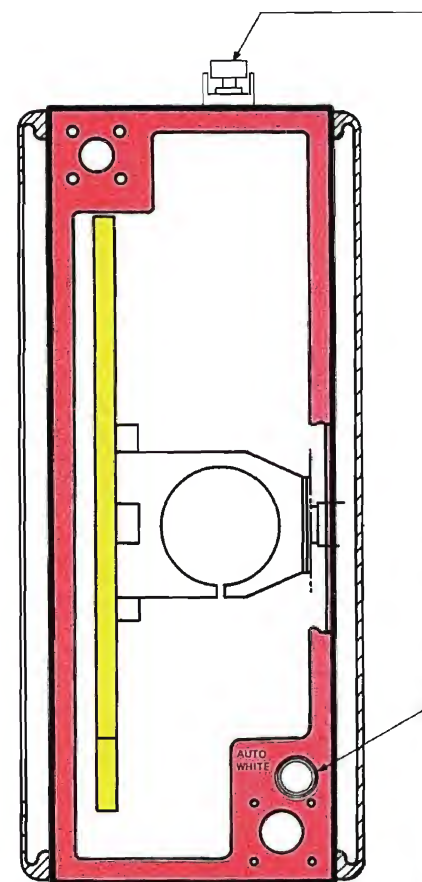
Hand-held portable cameras can be too light as well as too heavy. The weight of a well designed TV camera package should be sufficient so that the operator can hold a steady picture—even in circumstances where aggressive action is needed to capture the desired scene. The camera, however, must be light enough and well balanced for

## TK-76 A NEW PORTABLE VIDEO COLOR CAMERA

Film camera rugged,  
film camera light,  
film camera feel.  
No backpack.  
Great for one man news.  
And under  
\$35,000

### ORTHOGRAPHIC PROJECTION TK 76 PORTABLE

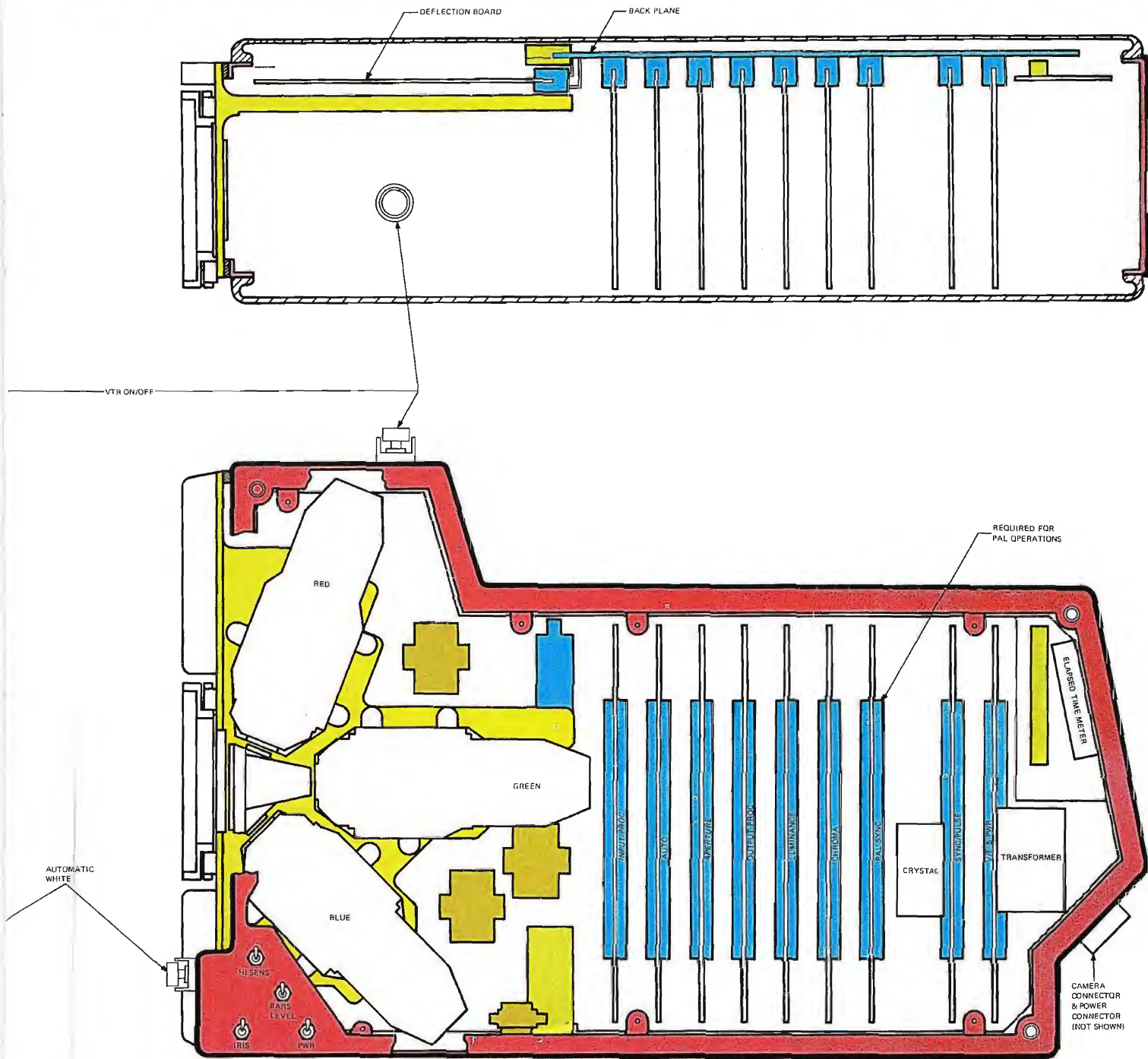
-  OPTICAL BASE PLATE
-  FRAME
-  PRINTED CIRCUIT BOARD CONNECTORS
-  YOKE CONNECTOR
-  INTERNAL WIRE DISCONNECT



Interchangeable peep sight or wide angle viewers are available. When the camera is transported, the viewfinder stores in a protected position (right).







Orthographic projection of TK-76 Portable Color Camera.

Viewfinder adjusts horizontally to comfortably fit the need of the operator, and is tiltable so the operator can easily follow any action.

# "All In A Day's Work" for T



*The TV camera  
with film camera  
freedom*

Fast-breaking six-alarmer



Regatta on the river



"Super savings" at the local food chain...

The attached photo insert  
of the TK-76 is shown in  
actual size



# K-76



...“more savings” at  
the auto agency

“Where to go”  
on the weekend?



Bicentennial drama



GO ANYWHERE!

comfortable maneuvering during long shoots. TK-76, according to experienced film camera operators, has a definite weight advantage, the "feel" of a 16mm cine camera, and is easily shifted through many operator body positions.

#### **TK-76 Is Completely Self-Contained**

There is no "backpack" or other external camera circuitry to the TK-76. Sync generator, signal processing, color encoding, etc., are all built in the compact TK-76 package. TK-76 output is an encoded color signal, ready for recording or for use directly "on-air". All camera electronics are part of camera head design, with the exception of the picture tube, associated deflection yoke and high voltage supply, which are located in the viewfinder.

The camera head has a flat bottom with a quick release wedge mount for convenience in transferring from shoulder to tripod or other support. (A single flick of the locking latch holds or releases the mount.) A rugged carrying handle at the top of the camera housing makes the TK-76 easy to carry even with a gloved hand.

The shoulder support, shown in illustrations, is designed to attach to the camera, via the wedge-mount, in a position that results in the camera weight being balanced front to back on the shoulder.

#### **Adjustable Viewfinder**

The adjustable viewfinder contributes to the ease and manner in which the TK-76 may be handled. The viewfinder contains a 1.5 inch diagonal picture tube plus tally and status indicators. The pentaprism viewer provides magnification and folds the light path through 90 degrees. Other electronics for the viewfinder are located within the camera housing. The viewfinder is mounted on an adjustable arm so that it may easily be positioned for maximum convenience and comfort of the operator who will see in the viewfinder a video image of that being picked up through the lens. Viewfinder horizontal adjustability and vertical tiltability lets

the camera operator use the TK-76 effectively from ground level through overhead positions.

While the eye-level pentaprism/magnifier will be most often used, it can be quickly replaced by a prism reflex sportfinder which provides full image viewing up to 2½" from the eye. The eye-level pentaprism accommodates correction eyepiece attachments from -5 to +3 diopters and also a rubber eye cup.

#### **12 Volt Battery Operation**

The recommended standard power source for TK-76 is a battery belt which contains a 12V rechargeable 4 ampere hour nickel-cadmium battery and a built-in trickle charger. The battery belt can be comfortably worn through long shoots, is readily available and already familiar to many telecasting operations. The 4 ampere hour battery will operate the TK-76 for 90 minutes. A built-in trickle charger requires 14 hours to bring the battery to a fully charged state. By using an accessory fast charger adapter the battery can be recharged in one hour.

The TK-76 operates from any 12V battery of sufficient capacity—found 'round-the-world in automobiles, boats and cycles. Cables are easily rigged for direct power take-off from typical cigar lighter outlets or directly from battery terminals. Easy availability of camera battery sources makes the TK-76 a versatile performer under many difficult operating conditions.

#### **Camera Design Accounts for Typical Rugged Operating Conditions**

The TK-76 camera head is a completely sealed package, a design which protects color registration in rugged use and which pays careful attention to ambient operating environments.

The front surface of the camera body contains a heat exchanger used to remove heat from the pickup tubes and deflection yoke assembly. The heat exchanger is part of the basic camera head mounting structure to which is attached the taking lens. Behind it is the

beam-splitting prism plus the deflection yoke assemblies for the three ⅜ inch pickup tubes. This subassembly is also thermally isolated from, and shock-mounted to, the camera body. This design approach for the lens, beam splitter, and pickup tube assembly has proven very successful in the TKP-45 portable production camera in maintaining mechanical mounting precision of all components associated with the optical image. Misregistration as a result of rough handling is minimized, a design feature of immense importance to all users.

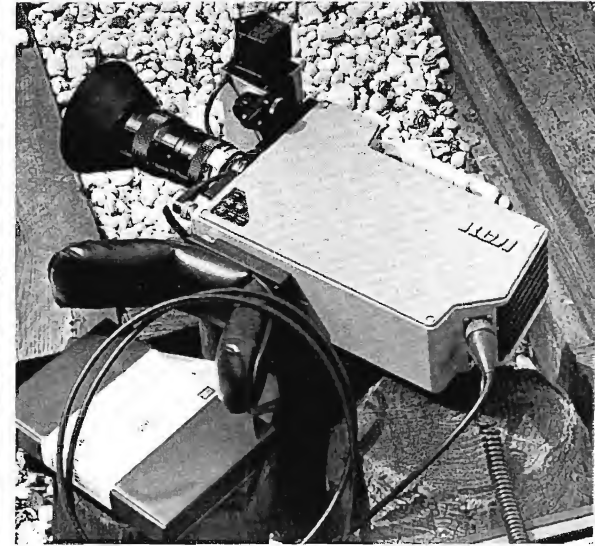
Behind the pickup tube assembly are located most of the plug-in circuit boards and the power supply located at the rear of the camera head. Heat from the power supply is conducted to a heat exchanger designed as an integral part of the camera frame structure. The circuit board containing deflection circuits for the pickup tubes is located behind the tube assembly. All circuit boards plug into a printed wiring interconnect board.

The beam splitting assembly has been designed to be a very compact prism and pickup tube configuration. The prism uses high index glass and has a limiting aperture of f.1.5.

#### **Automatic Features Make TK-76 Easy to Operate**

Pictures produced by a TK-76 portable color unit are consistent in colorimetry. They are maintained at a high quality level since critical adjustments may easily be made. Automatic White Balance, for instance, is achieved through the touch of a button as camera is focused on any white reference in the scene. Start/stop of the VTR, when used, is controlled by a button located adjacent to the carrying handle. Automatic Iris is controlled through a toggle switch with positions for automatic and manual mode of iris operation. Another toggle provides a switch for High Sensitivity, providing 9 db gain for extremely low light operation. When in Manual Iris, the operator can choose between two types of level indicators—one for peak white, or a combination of peak white and skin tone level. This





Long or short shoots are easily powered directly from a vehicular battery, or by plugging into the typical 12V cigar lighter outlets. The TK-76 is designed for the rigors of everyday operation in news gathering and production activities. Power from a 12V nickel-cadmium battery belt gives the camera operator complete freedom to roam at will.



latter type of level indicator is very convenient in assuring that skin tones are properly exposed when doing pick-ups of people when the surrounding lighting or backlighting conditions are adverse to automatic iris operation.

Power/Standby Control is also a 3-position toggle, center Off. The Standby mode is a battery saver position which permits almost instantaneous pictures when full power is applied.

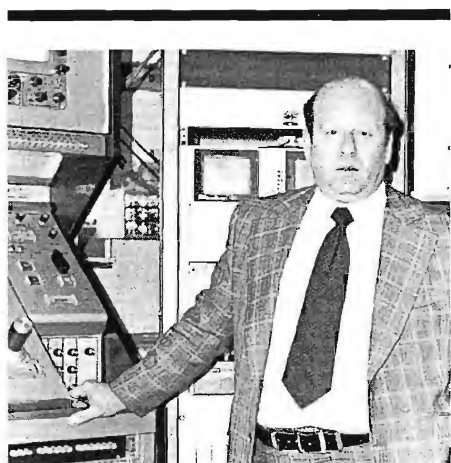
Basic TK-76 design includes a built-in 3-position filter wheel so camera operation can accommodate special effects and/or light correction.

#### **A Step Forward in Quality and Operation**

A major design goal of TK-76 is to encourage a more widespread use of video cameras in news gathering and related applications. This of course, can occur only if the video picture is of consistent high quality, the camera is mobile, versatile, easily handled, and can withstand the rugged applications it undoubtedly must encounter. TK-76 represents a step forward in each of these critical areas and when applied to both news gathering and other production operations will create new opportunities for the user.

# AUDIO+VIDEO LTD.

## A non-broadcast facility that gets a lot out of broadcasting equipment



*"Our whole cassette operation is based on quality, volume production. Downtime means lost revenue, but the output quality and operating reliability of the RCA telecine and VTR equipment are helping to keep the whole thing viable."*

IRVIN C. PANNAMAN  
Managing Director  
Audio + Video Ltd.

"Several video-signal sources feed gang duplicators churning out video-cassette copies at a fantastic rate. We're working at almost 95% capacity, and sometimes we're going 24 hours a day. For one customer alone, we've supplied 21,000 one-hour cassettes over a twelve-month period."

These comments were recently offered by Irvin Pannaman, Founder and Managing Director of Audio + Video Ltd.—a non-broadcast London TV company that knows how to use broadcast-standard equipment to full advantage.

Two quadruplex VTR's, a TR-60 and TR-70, and a TK-28 color telecine film chain have been pressed into service for A + V's rapidly expanding video-cassette copying business which is fairly substantial.

In the U.K., the video cassette concept has achieved enough of a marketing foothold to make A + V Britain's first authorized volume duplicator.

"We expected the development of our new cassette-duplication service to be a slow, uphill climb over the next year or two. But the whole thing bloomed faster than we anticipated. Two years ago duplication represented about 10% of our total annual business, and now it's more than 40%."

### Quality Up for Dubbing Down

Pannaman went on to explain that the development of the video cassette market—which includes industry, commerce, education and medicine—has been evolutionary, the sort of business investment he likes. "Exploiting the quality output and reliability of broadcast-type equipment," he said, "is one way we can protect it."

In the duplicating rooms, the TR-60 and TR-70 have already logged hundreds of trouble-free hours feeding clients' quad master tapes into a bank of duplicators turning out cassettes almost continuously.

Located in another room is the TK-28 film chain. It is used not only to transfer film to open-reel tape, but also to make full cassette dubs, or insertions directly into the cassettes.

When asked why the TK-28 was chosen over other telecine systems, Pannaman's answer again was quality. This camera, which actually corrects flaws or errors in the print at the film-to-tape transfer point, helps maintain consistently high quality in the end product. Also, some telecine equipment requires separate units for each film standard, which increases the cost of investment and thus the cost of duplication.

### Maintaining Cassette's Popularity

Commenting further on the need for quality, Pannaman said, "You have to make sure you maintain the cassette's value all the way through." And that's exactly what he's doing. Granted, the demand for cassettes is being fueled by professional communicators' growing recognition and acceptance of the concept. But the kind of copying service A + V offers helps keep its attractiveness going.

"Because it involves video-tape," Pannaman states, "the compact cassette format allows programs to be made quicker and at a lower cost than film. They can be produced today, duplicated tomorrow and then quickly and easily dispatched as fast and as far as air mail postage allows."



He further asserts that although film basically communicates the same way, its problem is the inconvenience in having to black out a room and set up a projector and screen. So a lot of communications specialists prefer the electronic medium.

#### Cassettes in Quantity

This seems to be the exact sentiment of Walport/Telmar, the world's largest marine entertainment company which commissioned A + V to duplicate the previously mentioned 21,000 video cassettes for their service.

Films and TV programs such as Doctor at Sea, Upstairs Downstairs and Teach Yourself Tennis are among the many hundreds of titles available to help while away seamen's time on merchant ships all over the world.

#### Low-Budget Techniques

However, feature films and 2-in. quad tapes aren't the only input sources that A + V utilizes for duplication. To serve customers with modest budgets, Pannaman makes the most of the TK-28 film chain's 35-mm slide and super-8 mm film projector inputs.

Slides are cheap and plentiful. And with the TK-28's TP-7 slide projector, it's an easy task to develop a cassette program—complete with voice-over, music and simple effects tracks. The result is a low-cost, but highly effective, visual presentation.

Austin Reed's menswear store in London had A + V employ this technique to make cassettes used in its store-wide centennial promotion last year. Commentary was dubbed in English, French and Danish, and the presentations were shown at strategic customer traffic points.

As for super-8 film material, Pannaman says that he's getting ready for future demand. He feels that communicators with small budgets will be using super-8 cameras more and more to make inexpensive in-house productions.

#### More TV Services

He has further increased A + V's flexibility with land lines to the Post Office Tower, the U. K.'s telecommunications center. This setup lets him buy time on high-cost equipment with relatively low utilization from outside companies. It is also used for inter-city video communications throughout Britain.

With such access to additional facilities, the complex's Whitfield Street plant in London is devoted mainly to the massive duplication equipment. However, it does include a small production studio with three cameras. Telecine or VTR can be piped in and the studio output can be recorded on the TR-60.

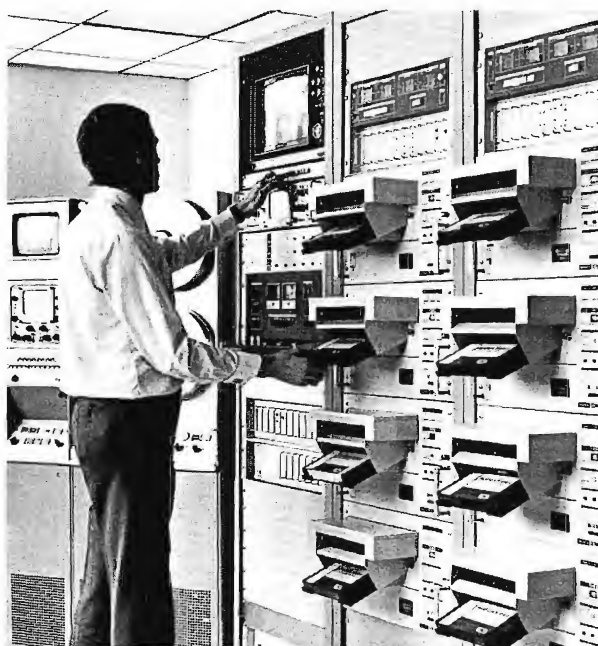
This same studio also incorporates a viewing lounge where clients can watch tapes in almost every type of format and standard around, including NTSC. Obversely, PAL replay facilities are offered in New York. Pannaman has set this up to allow his customers to send samples of their work to agency associates, the networks or others in the U.S. for viewing.

A + V also offers acclimatization courses designed to train senior executives for TV appearances. Interestingly, such sessions have been conducted for

over 16 years, during which time more than 10,000 company chairmen, managing directors and senior management personnel have appeared before the company's studio cameras.

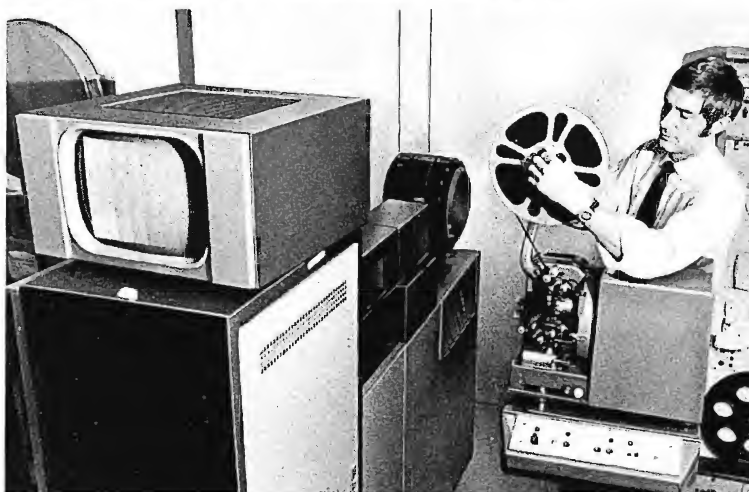
Completing the total range of services are equipment sales and rentals and coordination of installations in behalf of overseas clients.

Twenty years ago, A + V began as a CCTV company. Today it's very broadly based. Pannaman feels his pre- and post-production facilities are among the most comprehensive in Europe. A graduate of film, he sums up his commitment to the TV industry with this: "My faith in video is stronger than ever, but my future planning will, as always, be tempered with realism. Only in this way can we ensure that our industry continues to prosper and grow."



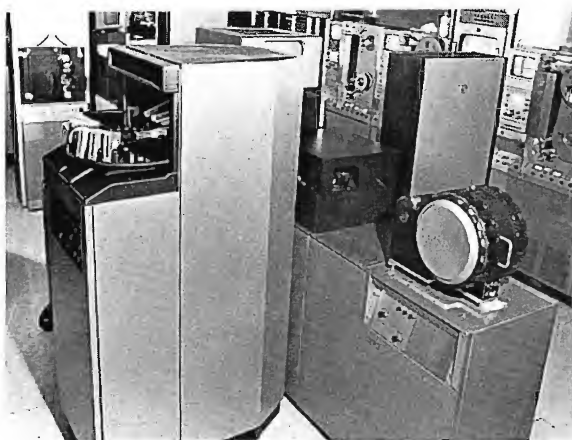
Cassettes are produced in quantity from 2-in. video tape masters played back on the TR-60 quadruplex VTR. A TR-70 is also used as head equipment.

A TK-28 telecine chain allows insertion of film or slide material to the cassettes. It has super-8mm, 16mm and 35mm film projectors plus a 35mm slide projector, and is also employed for a very active film-to-tape transfer service.



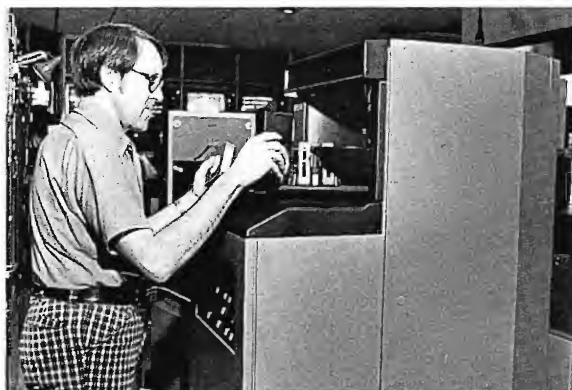


# KYTV SPRINGFIELD, MISSOURI.

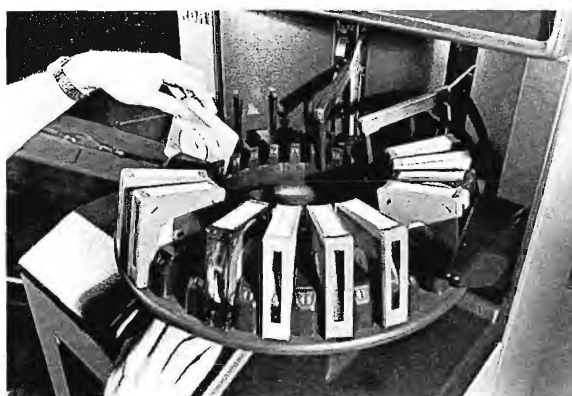


## New Cartridge Film Island for

Latest additions to KY-3's technical area are two TK-28 telecine islands, one equipped with a TCP-1624 Cartridge Film System (foreground).



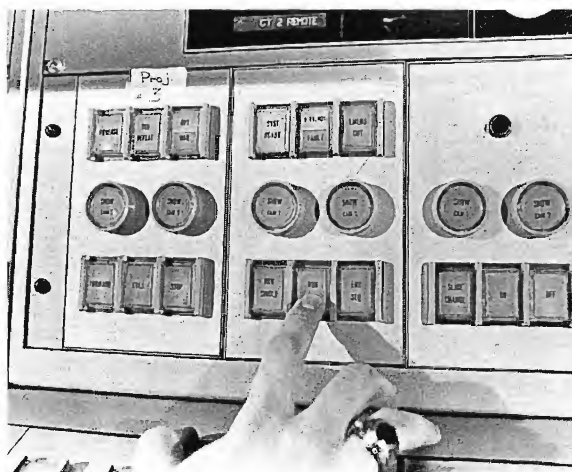
In addition to its primary function of airing film spot commercials, KYTV has made use of the film "cart" system for production applications.



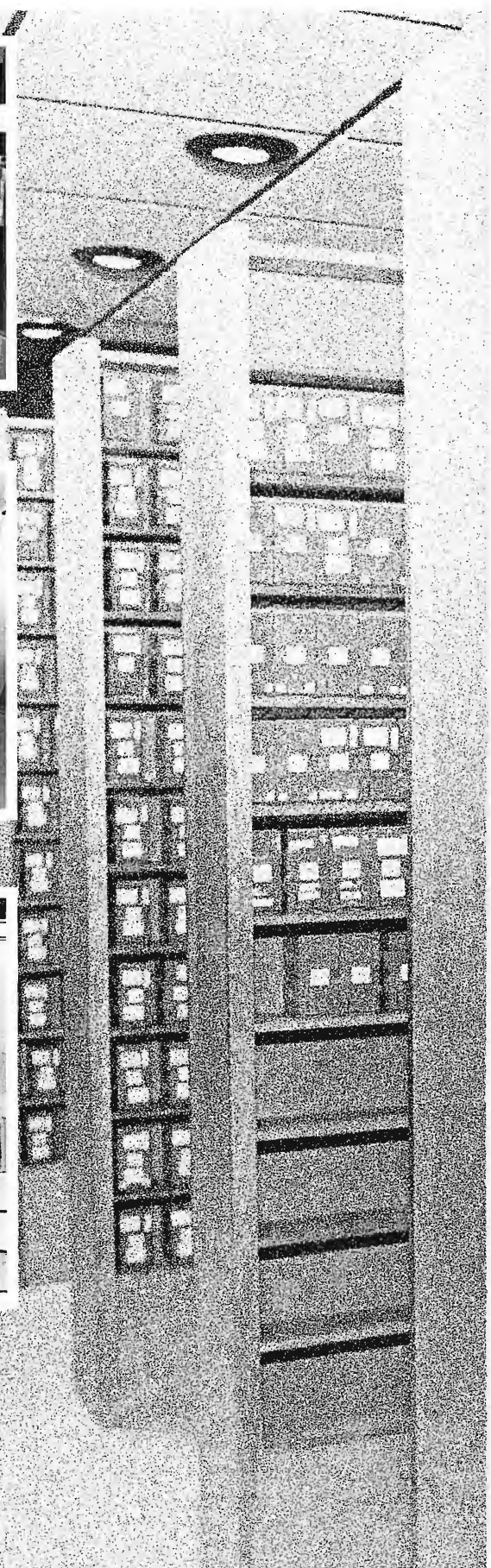
"Empty slot" programming is a convenient way of operating the TCP-1624.



Once the film cartridge is loaded, film handling is ended for the life of the spot.

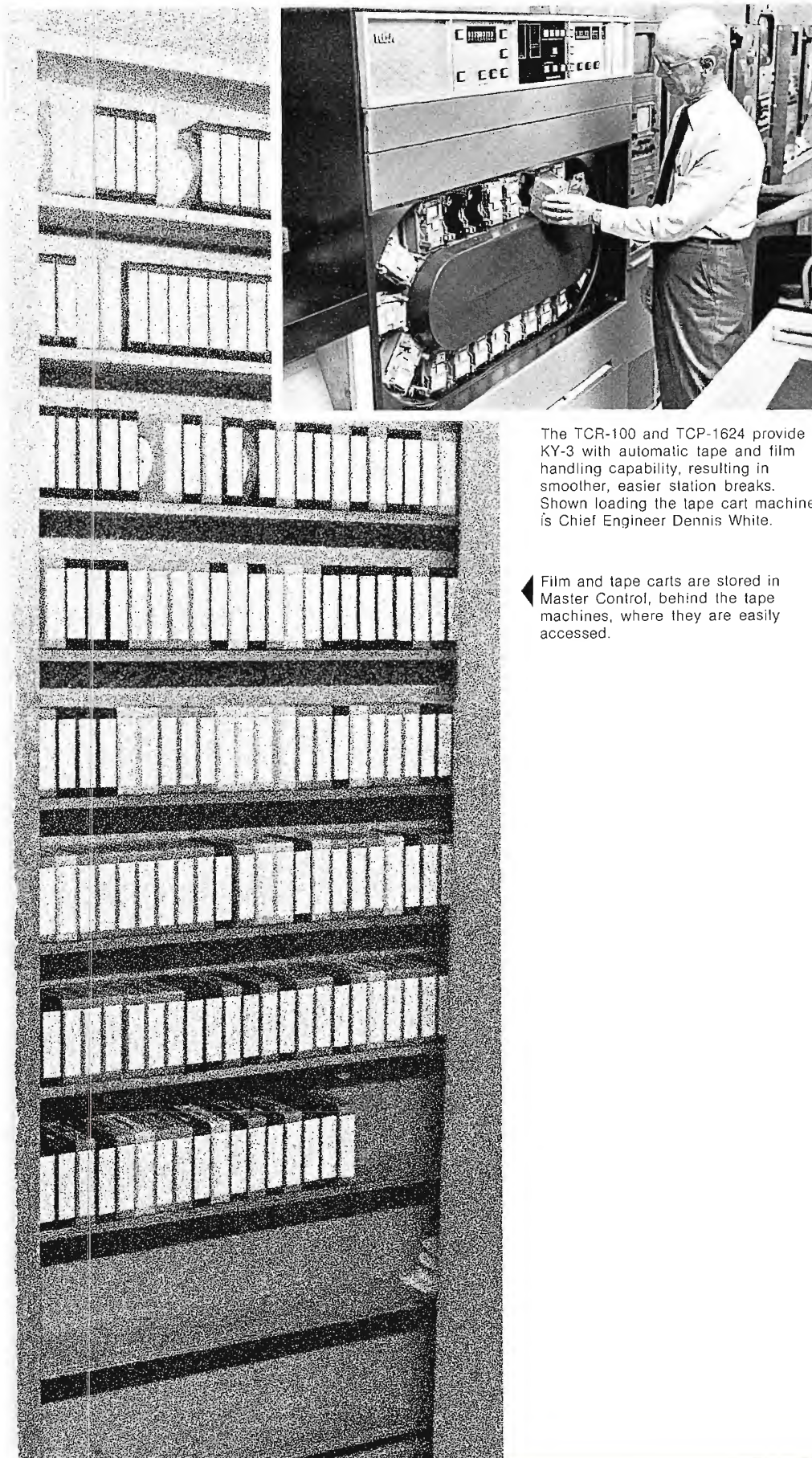


At KY-3, all film and tape machines are remoted to Master Control.





## Film System at KYTV Frees A Production



The TCR-100 and TCP-1624 provide KY-3 with automatic tape and film handling capability, resulting in smoother, easier station breaks. Shown loading the tape cart machine is Chief Engineer Dennis White.

◀ Film and tape carts are stored in Master Control, behind the tape machines, where they are easily accessed.

**P**rogressive KYTV, Ch. 3, Springfield, Missouri, operates on a planned investment program for keeping its technical facilities constantly updated. Well before major equipment is depreciated, plans are made for its replacement. This program was highlighted in a BROADCAST NEWS article "Sound Station Management Keeps KYTV Picture Bright" (Vol. #154).

Production has become an increasingly important operation at KY-3. With expanding activity in the production of local commercials, programs and dubbing assignments, the station's excellent facilities were straining to keep pace.

### Two New Telecine Islands

Chief Engineer Dennis White recognized that more machine capability and efficiency were needed to accommodate the On-Air and production demands. The scheduled replacement of two telecine islands provided the opportunity to upgrade as well as to improve technical performance and to increase film handling capacity.

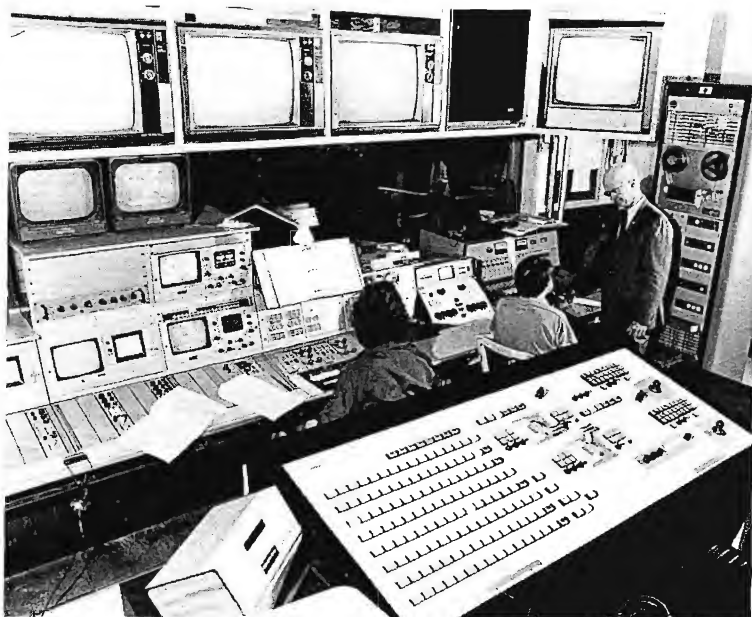
KY-3 film facilities now include two new islands with TK-28 color cameras; TP-55 Multiplexers; TP-66 and TP-7 Projectors. A TCP-1624 Cartridge Film System is installed on one of the islands. Indicative of the station's emphasis on technical excellence, the TK-28 cameras were ordered complete with ASCET (Automatic System for Correction of Errors in Telecine).

Installed in July, 1975, the Cartridge Film System proved an instant success at KYTV. Reliability has been excellent, Mr. White says. And, he adds, with the film "cart" system handling film spots, only one of the two telecine islands has been needed for On-Air operations. The second island with its two TP-66's and TP-7 is available for full-time production use which can now be scheduled during the day as well as the evening shift.

Installing the TCP-1624 on the film island also was surprisingly easy, Mr. White notes. "The machine was shipped on a dolly, ready for rolling into place. Thereafter it was a simple matter of positioning for optical alignment and making the video and audio connections.

### Cartridge Film System Used for Production

The combination of the TCP-1624 and the TK-28 has resulted in a better On-Air presentation of commercials and film programs. In addition, some fea-



The Master Control and production control arrangement is functional and efficient. The TS-70 video switcher is elevated, so the MC operator has full visibility to all available film and tape sources, as well as video, audio and studio operations.

tures of the TCP-1624 anticipated its potential usage as a production aid. For example, KY-3's astute production crew quickly latched on to the stop-on-frame capability of the film "cart" system as an easy means for making single frame inserts in tapes. The instant start and stop features of the 1624 are ideally suited for program assembly; for handling film-to-tape transfers of short film segments which could be loaded on cartridges.

KY-3 has already used the TCP-1624 for airing news film. For this situation, the automatic soundtrack sensing feature is an excellent one, according to Mr. White, since some commercials and virtually all of the news footage comes with magnetic sound. The "cart" machine automatically switches to the correct sound track setting, relieving the operator of the concern for setting the projector for either optical or magnetic sound.

#### **Tape and Film "Carts" Complement Each Other**

The tape facilities at KY-3 include a TCR-100 video "cart" machine installed in 1973. The two cart machines complement each other in station operation. The smooth transitions and easy handling of tape and film spots enhance

the station's On-Air appearance, Mr. White says.

KY-3 operates with a small staff. Usually Master Control is a two-man operation, with one man handling the On-Air switching and the other loading the tape and film machines. A third man is added during the heavy news breaks and evening production period. The TCR-100 and TCP-1624 help make this lean operation possible by minimizing the handling of short tape and film segments.

Even with the installation of the Cartridge Film Projector, Mr. White does not anticipate a change in the operation or utilization of the TCR-100, since most of the material dubbed to tape "carts" comes from tape reels. Except for saturation schedules, film spots are seldom dubbed to tape at KYTV. However, the TCR-100 is used frequently for adding dealer tags to commercials as a convenience to the Master Control operation, Mr. White says. This procedure also minimizes errors and makes for a better presentation on-air. Most of the film spots received at KYTV are of 10, 20 and 30-second duration. For advertising campaigns calling for saturation spots, Mr. White sees the possibility of dubbing these commercials to

the TCR-100 as well as using the film cart for playback.

#### **"Empty Slot" Programming**

The TCP-1624 at KYTV is operated in the "Automatic Sequence" mode, usually with an empty slot between sequences. "Empty slot" is a convenient way of programming the film "cart" system. After setting up a sequence of carts to run automatically, the next slot on the cart magazine is left empty. The machine senses the empty slot and waits for the command to start the next sequence. The empty slot gives the operator an extra degree of visual assurance of the end a sequence.

One of the less obvious advantages of the all-cart operation, Dennis White says, is that Engineering has control of the carts. The current tape and film carts are stored in the Master Control area in open shelves for quick access. The film cartridge provides an ideal filing system for spot film commercials and PSA's. They're easy to identify and are dust-protected in the cartridge. The plan at KY-3 is to color-code the carts for even easier filing. Red, blue and gray colored cartridges are on hand, so that commercials, PSA's and other filmed material can be easily classified and located. The station has 500 cartridges on hand, with more than half of them loaded and in use. The TCP-1624 is averaging about 70 plays per day, while the TCR-100 average is 130.

One person is assigned to load the film cartridges. Once having acquired the knack of setting up the EOM cue mark and splicing on the Mylar leader, the loading procedure is relatively routine. Moreover, once the cart is loaded, the film handling is over for the use-period of the spot.

#### **Automatic Film and Tape Station Break**

The addition of the TCP-1624 to the KYTV telecine area has proved to be a worthwhile investment. Through improved film-handling efficiency, it has released one telecine island for production. And, with the TCR-100 video cart machine and the TCP-1624 film cart system both on-stream, station breaks with tape and film segments can be handled automatically.

For broadcasters like KYTV, operating with heavy spot schedules plus growing production demands, the automatic cartridge tape and film systems can be an effective combination for accommodating increased workloads.



## NBC Burbank Adds Four TR-600s To Extensive Tape Complement

**T**HE bustling, hyper-active NBC complex at Burbank is comprised of four technical operating areas, explains John Frishette, Manager of Technical Systems and Maintenance. These are:

- KNBC-TV, Ch. 4, the local Owned-and-Operated station
- Production and Post-Production
- News
- West Coast Network origination and delayed Broadcast

Handling the volume of traffic in these diverse operations requires a tremendous investment in all types of television broadcast equipment, particularly in video tape machines. The tape complement at NBC Burbank includes twenty-six quadruplex reel-to-reel VTR's, with an additional four TCR-100 video cartridge tape machines used for commercial playbacks. In addition to the quad machines, a number of other tape recorders—one-inch reel and  $\frac{3}{4}$ -inch cassette types—are used for off-line tape editing and for news assignments.

Steve Orland, Supervisor, Video Tape Technical Operations, with one of the new TR-600 VTR's installed at NBC Burbank.



Even with this array of tape equipment, Mr. Frishette notes, it takes some juggling during pressure periods to meet demands.

#### **Varied Assignments for VTR's**

Four new RCA TR-600 Tape Recorders have been on-line since July. Added to meet the growing tape requirements at NBC, the TR-600's were selected for their performance capability and compact size. Two of these machines are used almost totally for recording and delayed broadcast playback. The other two are used for varied assignments, reports Steve Orland, Supervisor, Video Tape Technical Operations. For example:

- Recording KNBC-TV news
- Recording the slave camera output from "Sanford and Son", "Chico and the Man" and other major productions
- Transferring the "movies" from film to tape
- Recording the "Sanford and Son", "Chico and the Man" and other shows for shipping to Honolulu and Anchorage
- Viewings of upcoming programs

A pair of the TR-600's are sometimes assigned to record the "Tonight" show which is taped from 5:30 to 7:00 P.M. Pacific Time for airing at 11:30 P.M. in the East. The show is also broadcast to the West Coast network at 11:30 P.M. local time.

NBC's "Monday Night at the Movies" for example is produced at Burbank on Wednesday. Programmed by the NBC computer, network commercials, bumpers and lead-ins are all integrated, and the composite movie is recorded on tape, with four copies made. Two of these are shipped to New York, while the other two are retained at Burbank for West Coast network playback.

#### **TR-600's Measure Up**

Since the initial "get acquainted" period, the TR-600's have functioned well, according to Mr. Orland. Their reliability has been good, and the record and playback quality has been up to TR-70 performance standards. The ability of the machine to be flush-



With tight TV deadlines, computerized tape editing is an essential operation.

mounted against the wall has been helpful, as has its compact size. In the areas where the TR-600's are presently located in Burbank, not enough space was available to accommodate larger machines.

Reduced power requirements as well as its compactness make the TR-600 particularly suited for use in mobile units, adds John Frishette. Also, with the bridge offered as an option, he says, users have more flexibility in setting up the tape machines to fit their operating needs. In this instance, NBC required the bridge, for additional monitoring and control facilities.

#### **Network Delay**

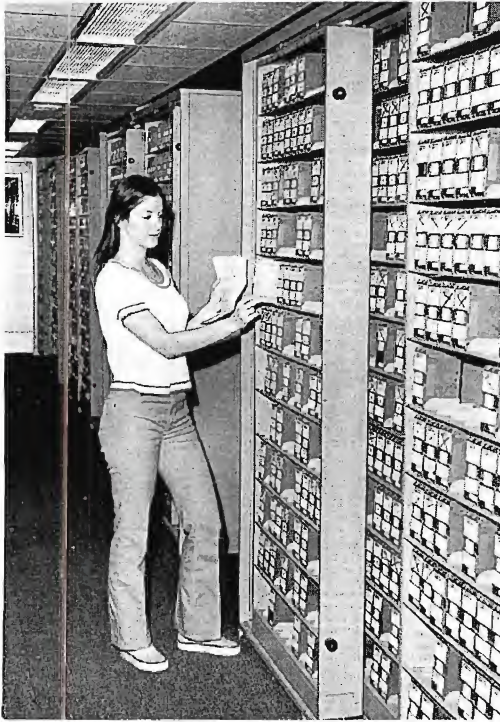
Two TR-600's and two TR-70 machines are used for the delay broadcast operation. The recording and playback operations are always duplicated for back-up protection. The paired machines handle 90 minutes of record or playback, and then the second pair of

machines are switched on. NBC Burbank is the source for West Coast network feeds—from San Diego to Spokane.

The network delay operation starts at 5:00 A.M., recording the "Today" show for later broadcast. The delayed recording and playback continues throughout the entire day, including the game shows and daytime serials. During the evening, these VTR's are used for recording NBC nightly news and News Service for NBC affiliates, which are played back to the West Coast network stations, as well as recording production shows. Essentially, the tape machines are functioning from 5:00 A.M. until 11:00 P.M., with minimal open time.

During the daytime when network programming is received from the East, the commercials are already integrated. In the evening, the commercials must be inserted at Burbank for the West Coast network feed. The four TCR-





Four TCR-100's are installed, two in a bay, with complete monitoring facilities. Machines are loaded from carriages which bring scheduled carts from storage area. With 8,000 "carts" on hand at NBC Burbank, storage and cataloging systems are critical. Rolling shelving provides ready access to stored carts.



100's have made this a smoother, less frantic operation. Reflecting the volume of tape cart traffic, Steve Orland points out that there are 8,000 carts on hand, stored on rolling, four-deep shelving.

#### Slave Camera Recording

One application of the TR-600's at NBC is for recording the slave camera output from major productions such as "Sanford and Son". This is a direct recording, with the camera concentrating on closeups of the star, while other cameras handling the show which follow the director's instructions are fed via a video switcher to other recorder. The slave camera tapes are reviewed during editing and selected footage is inserted into the edited tape.



The four new TR-600 Tape Recorders installed at NBC Burbank are getting heavy usage in a variety of applications, and are delivering the quality performance required for critical operations.



# maine

## PUBLIC BROADCASTING NETWORK...

### a continuing success story

You've just cleared the Boston traffic, heading north on I-95, on your first trip to Maine. You know pretty much what to expect: boiled lobster and clams served just out of the reach of a pounding surf; miles and miles of beautiful green forests with scads of wildlife; fresh, brisk, clean air.

About an hour later you crash the Maine border and you know you've arrived. Signs let you know there are "Ski Areas" to the north; "Acadia National Park" on the coast; "Moose Area Next 18 Miles". You roll down the car window, turn up the old FM full-blast, take a deep breath, and hear . . . Mozart? That's right, because now you're in MPBN country.

MPBN (the Maine Public Broadcasting Network) is a seldom paralleled success story in a rural, basically agricultural state with a population of around one-million, that's well off the beaten path. It's not yet a cultural mecca, but the state's semi-isolated and semi-developed condition (a surprisingly small percent of the state is settled) has drawn new people to Maine and stemmed a historical out-migration.

#### Broadcasting Network Begins in 1961

Maine's citizens are culturally aware and greedy for education, hence the state sports a very comprehensive university system and a progressive vocational education program. It is because of this awareness and appreciation of education and the university's integral

part in offering it, that MPBN has grown and continues to expand.

The MPBN story began humbly enough in 1961 when the network was created by the 100th Maine Legislature. The voters ratified the creation in 1962 by approving a \$1.5 million bond issue referendum. This money was used to construct three television stations in northeastern Maine; the acquisition and construction of nearly 700 miles of microwave equipment which begins in Boston and connects MPBN with regional and national television programming networks; and the renovation of a women's gym on the Orono campus as the major production center.

#### Network Parallels University System Growth

Since that time the University of Maine structure has changed into a statewide system, and MPBN has paralleled that change. The two-year teachers' colleges around the state were beefed up throughout the 1960s and soon became full-fledged degree granting four-year facilities. MPBN originates from several of the campuses occasionally, as well as advising individual campus broadcasting facilities. As the university expanded its base of operations to better serve the people of Maine, likewise did MPBN.

In addition to the three original stations in Presque Isle, Calais and Orono, MPBN's newest, channel 26 in Biddeford, signed-on in early 1975. Working in cooperation with WCBB in Augusta, an independent station licensed to three private colleges and serving south central Maine, the entire state now receives a full schedule of public television broadcasts.

#### Public TV First, Then Radio

The story of MPBN entered a new chapter in 1970 when public radio was

Maine Public Broadcasting Network personality Joan Young hosts the locally-produced children's programs "The News Machine" and "La Machine Magique". The latter program was developed for the state's Franco-American children.



introduced to Maine. WMEH-FM in Bangor signed-on in 1970, followed in 1974 by WMEA-FM in Portland. A third FM stereo station is planned for the northern portion of the state within two years and this will complete the statewide radio network.

MPBN Radio is truly an "alternative" for Maine radio listeners. Combining the talents and programming variety of National Public Radio, the Eastern Public Radio Network and MPBN's own radio staff, public radio in Maine consists of more than 10 hours per day of serious music (not available through any other broadcast outlet in the state) and many hours every day of top notch national and local public affairs broadcasting.

More than one-half of MPBN Radio's 17 hour day (11 hours) is dedicated to local productions, such as Afternoon Concert, Morning Magazine, All Things Considered in Maine and Evening Concert. Additionally, MPBN offers live Boston Symphony Orchestra broadcasts, radio drama, a reading service for the blind, and Morning Pro Musica from Boston.

Many local productions are hosted by volunteer personnel in an area of special expertise, including programs like Early Musick, hosted by a UMO English professor, and a special series highlighting the music of Charles Ives with commentary by a university music professor. The work of these volunteer producers at MPBN exemplifies the close working relationships between the university and MPBN.

#### MPBN Broadens Scope

The completion of a statewide public television and radio network (one of MPBN's legislative mandates) behind it, the MPBN storyline turns to the network's other major functions; a public broadcasting production center and a major public telecommunications agency for the state.

As a telecommunications agency, MPBN gives planning and assistance to other agencies of the state and the university in the development of new educational,

administrative and medical interactive communications systems.

In addition to its regular broadcast and production endeavors, MPBN:

- Advises to and maintains campus radio stations on five of the seven University of Maine campuses.
- Operates a unique TV venture in which electrical engineering faculty at the University of Maine at Orono teach classes to engineers at Fairchild Semiconductor in Portland, 150 miles away, saving travel expenses and time.
- Operates a medical interactive communications system between Stonington and Blue Hill (a closed circuit television system between a coastal hospital and a populated island where no physician is available).
- Cooperates with institutions in a continuing effort to realize better and more vital medical interactive closed circuit services, especially in the realm of medical education and instruction.

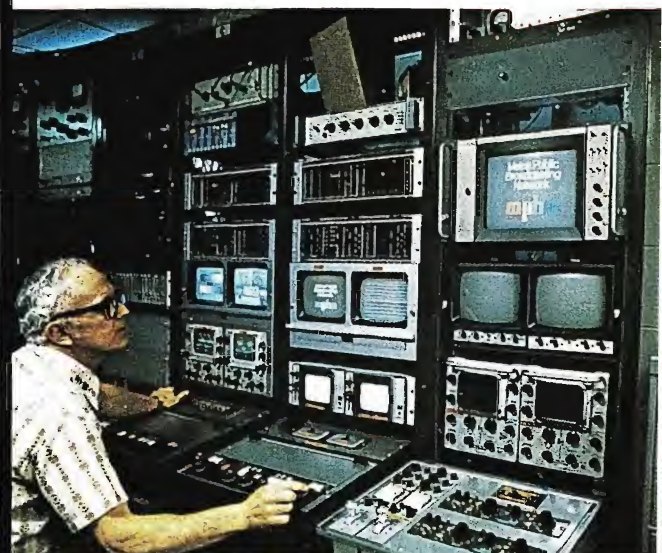
MPBN is providing an extensive instructional television schedule to primary and secondary level students, and is working toward the development of more college level courses. And, beyond this effort, the Network is constantly pursuing the potential of the open learning situation within the walls of Maine homes.

#### A Major Television Producer

In terms of television production, MPBN is ranked third in New England in total production volume and is a contributing member of the Public Broadcasting Service and the Eastern Educational Television Network. Besides MPBN's public affairs and interview programs broadcast each week night, "The News Machine," a news magazine of the air for kindergarten through third graders (and French counterpart "La Machine Magique") are weekly productions, as is "By the People," a public access half hour. The Franco-American Children's Television



Video operator Paul Martin handles shading for the two TK-44B cameras assigned to studio use.



Two FM stations are a part of the MPBN. Shown here in one of the studio control rooms is Radio Production Manager John Emery.



TR-61 VTR's are installed in the studio as well as in the mobile unit. Technician Rome Thibeault makes adjustments on studio VTR #4.



On location with the mobile unit are Chief Engineer Ed Winchester; former General Manager John Morison, and cameraman Dana Larrabee. (Mr. Morison is now General Manager of WHRO-TV.)

Series, a federally funded two-year program; "In and Out of Maine," an examination of Maine population flow, and special events broadcasts are just several of the on-going projects at MPBN.

Financially too, MPBN has grown since its opening chapter was written, showing unequivocally the support of the Maine people for public broadcasting. Five years ago the network's total legislative appropriation was \$420,000, with roughly \$20,000 in other income. MPBN's legislative appropriation has now reached the \$900,000 level with more than \$500,000 in other income available.

#### Oneness—A Unique Ingredient

There are a number of unique things about MPBN which, like the characteristics of a success story hero, makes the story a success. MPBN is a joint radio/television licensee and educational telecommunications service licensed to the University of Maine Board of Trustees. Oneness is important with MPBN's structure, where many other statewide or local networks often work at odds. For instance, MPBN public affairs producers share space, ideas and equipment, where feasible, for both television and radio. The nightly television interview programs are heard daily on radio. Radio and television producers often combine talents for coverage of major events. This structure saves man hours, lends to the creation



of a better production; and eliminates one-up-manship on either side.

In addition to this type of sharing and despite the seeming disparity between television, film production, radio, cable television, instructional television, educational telecommunications, public services, etc., there is only one programming division, one engineering division and one public services division. This structure keeps the bureaucracy to a minimum and a free flow of information between division administrative personnel a possibility.

#### **Mobile Unit—"The State Is Our Studio"**

MPBN has recently undergone a major expansion and modernization effort which will enable it to be still more responsive to the needs of Maine citizens. With the acquisition of a television mobile unit from RCA, the network now has the capability to go anywhere to produce television programs of statewide interest. The 40-foot trailer van is fully equipped with three TK-44B color cameras, video tape machines, audio and video switching and control equipment. MPBN calls it "the best production unit north of Boston".

Complementing this mobile production unit, the Orono studio is equipped with two additional TK-44B cameras, new TK-28 color telecine system and two TR-61 tape machines. For elaborate location productions, the two studio cameras can be added to the three normally carried on the van.

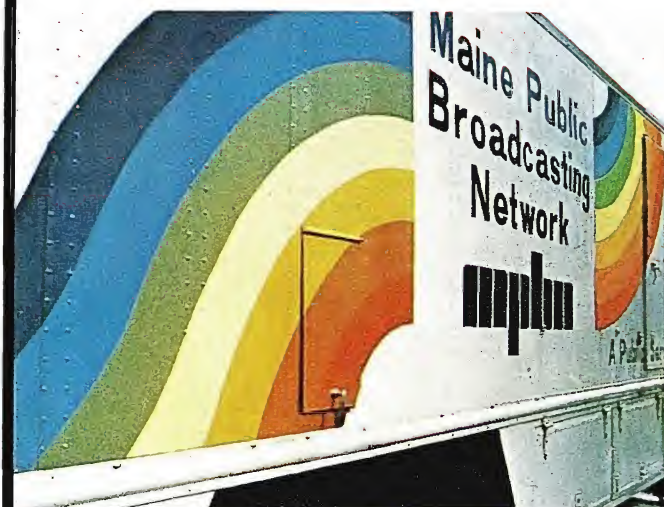
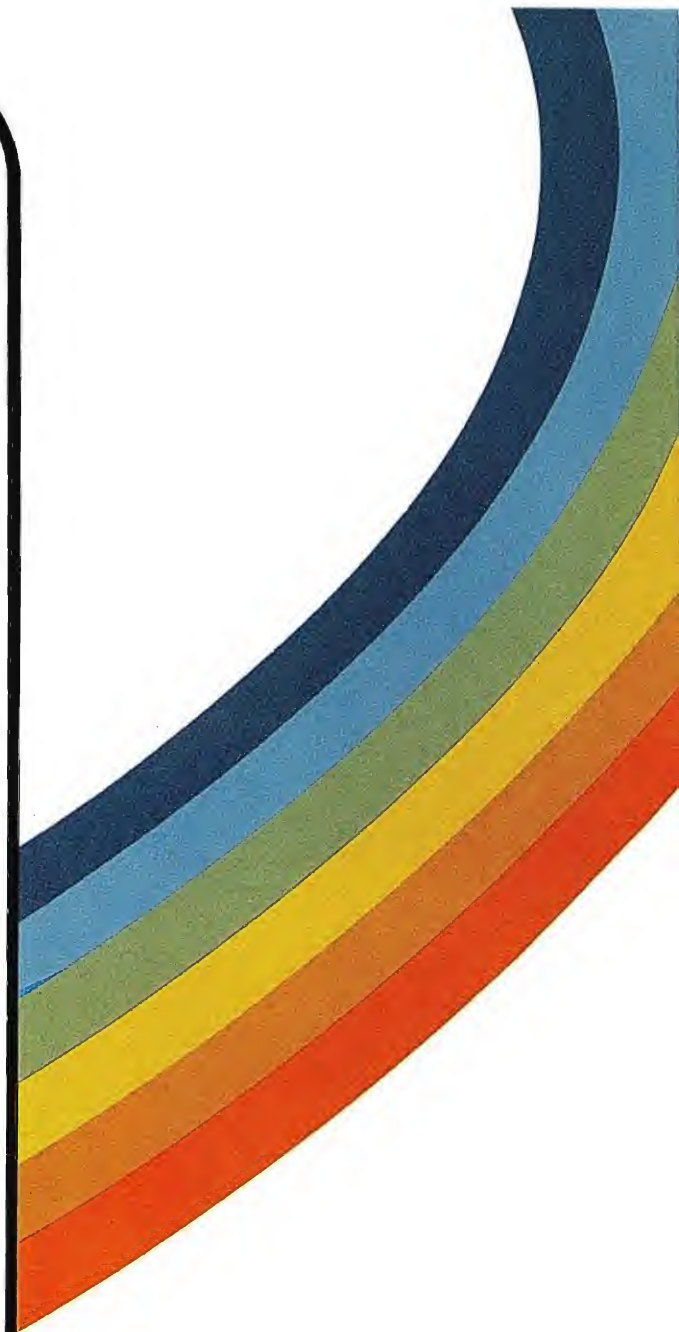
The mobile unit has been used for the outdoor taping of a dramatic piece, the installation of a Roman Catholic Bishop, the inauguration of a Maine governor, and a variety of other on-location productions.

#### **Coming: A New Broadcast Center**

The pace of success is ever-quickenning and MPBN hopes soon to be in a new and permanent home. The University of Maine Trustees will request \$2.9 million from the Maine Legislature to construct the Center for Maine Public Broadcasting. The current production center lacks office and storage space, proper ventilation and environmental controls necessary for the new equipment, and suffers from many general limitations in the special areas required for a professional broadcasting production center.

The new center will have roughly 50,000 square feet in space (four times the present space) and will provide modern television and radio production studios, construction and storage space, tape and film library, art and photography facilities, and adequate administrative and creative staff office space.

You've come to Maine and seen what you expected, but maybe you've seen and heard some things in Maine you weren't expecting: one of the finest public broadcasting and production networks anywhere. MPBN is a continuing success story.

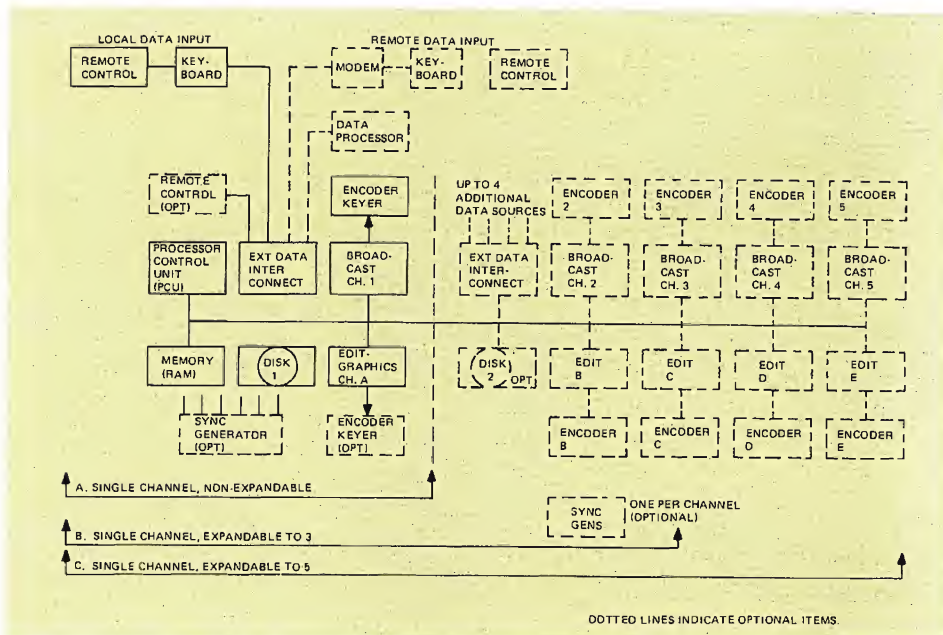


The state is the studio for MPBN's fully equipped 40-foot mobile unit.

# VIDEO IV

A versatile new character generator

Video IV System. Keyboard-composed copy is displayed on the Edit/Graphics channel (lower monitor) while the edited copy appears on the upper monitor.



Video IV is available in three system configurations, with numerous options.

**V**IDEO IV is far more than just another character generator—it is a versatile, total graphics production system developed by RCA.

This new system is not limited to the standard alphanumeric titling capabilities, but can provide a complete range of symbols, graphics, maps, charts, figures—and even a degree of animation which was impossible with earlier systems. Foreign language symbols can be generated, and special fonts can be composed on the Video IV keyboard. Even more versatility is added to the system by the new camera compose option.

Message and graphics composition are accomplished directly from a standard keyboard, and recall of titles and graphics for On-Air use may be done either via the keyboard, or by a remote control unit. A magnetic drive system is utilized for bulk storage of messages. The bulk memory capacity of this magnetic “floppy” disk system permits maintaining an extensive file of pre-programmed material which is readily recalled on demand.

A choice of eight colors is available which can be selected for individual letters; for words; for color edges or

letters, and for backgrounds. The output of the color encoder is NTSC, standard PAL or PAL-M color video, depending on the operating standard required. An Edge Key Signal also is available so that the titles may be programmed through the video switcher/effects system using the External Key mode or by means of a downstream insert keyer.

### Three Systems Available

Video IV is available in three different system configurations (see diagram). The smallest, which, for convenience we call the “Mobile” system, is a single-channel system and is not expandable to additional channels. Several options are available, however, which increase its flexibility—such as additional keyboards and font create.

The system includes back plane interface wiring for the addition of one disk drive and a camera compose interface unit. The color encoder for the Edit

and Graphics channel is optional as are additional keyboards and remote controls.

The second system may be ordered with from one to three channels, broadcast and edit, for a total of six, or it may be expanded from one to two or three channels at any time after delivery. The largest system is similar, except that it may be expanded to ten channels—five Broadcast and five Edit. Each channel may have its own color encoder and sync generator, as shown on the diagram.

Multi-channel systems are especially useful in operations with more than one control facility, such as several studios plus Master Control. A keyboard and Remote Control may be placed at each location and a Broadcast and Edit channel assigned to each. Even though much of the central processor is common, the separate channels can operate on separate sync generators. Furthermore, data in one channel can be transferred to another on command. If for some reason a program scheduled for one studio must be done from another, the data for that program can be recalled from disk storage and used by any available channel.

R. H. PATRICK, RCA Ltd., Canada

R. P. MAJOR, Control Equipment Product Management Broadcast Systems, Camden





This standard keyboard is the most frequently used Video IV input. Up to four may be used with each system.

### System Architecture

Video IV uses computer circuits and logic to produce titles and graphics. The system is controlled by a software program which is stored on magnetic disk. The program may be modified to make improvements or complete new programs may be supplied via new disk cartridges. All inputs to the system are via EIA standard RS-232-C compatible ports to accommodate direct computer input, teletypewriter, keyboard, remote control, or modems for long distance data input. All inputs use the USASCII 8 bit serial code. The keyboard and remote control connections to the central processor are by shielded pair, and a maximum of eight simultaneous inputs may be used with the system.

A wide variety of characters and symbol styles or fonts is available, but for maximum versatility two methods of font composition are supplied as options. Characters and symbols may be composed using only the keyboard, or a system of digitizing video signals from a television camera which provides the ultimate in composition capability.

### Keyboard Operation

The most visible—and most frequently used input for the Video IV system—is the standard keyboard, up to four of which may be used with each system. Using the Video IV keyboard, all of the standard programming can be controlled or initiated:

- Characters can be selected on the broadcast and edit channels.
- Character color can be selected on both.
- Character edging on the broadcast channel can be selected (See Edging).
- Edge color can be selected on the broadcast channel.
- Character background color can be selected on both channels.
- Full Raster background color may be selected on both channels.

- A character, line, or page can be erased.
- A page can be transferred from one channel (BC or edit) to another broadcast or edit channel.
- A line of data can be inserted.
- A line of data can be removed and the balance of the display closed.
- The display can be centered by the line or page.
- A single character, word, line, a number of lines, or a full page can be flashed.
- Data can be made to crawl on any line, without disturbing the remaining lines.
- Crawl speed may be selected from over 300 speeds.
- Data can be made to roll within a window created between any two lines.
- Roll speed can be selected from over 300 speeds.
- Data can be recorded or played back.
- Fonts can be recorded or played back.
- Disk address can be automatically displayed at a pre-determined location on the edit or broadcast channel by keyboard selection.
- Fonts can be created from the keyboard.
- Pictures can be drawn on the edit channel.
- The source for titles, roll and crawl can be selected as any disk drive or Video channel in the system.

For computerized installations, all Video IV keyboard operations can be performed by a remote or local computer. In addition, all keyboard functions can be performed with a teletypewriter, with the exception of lower case alpha-numerics.

### Remote Control Panel Operation

The Video IV Remote Control Panel (RCP) is a special control keyboard designed to facilitate easy and speedy command entry and display control for any channel in the system. It may be used in conjunction with a regular Video IV Keyboard, or as a stand-alone input device connected to any input port.

The Remote Control Panel provides all of the controls needed to recall messages from the disk, including:

- Transfer a page of information from one specified source channel to another channel.
- Transfer a page of information (or less) from a specified disk address and disk to a specified on air channel and line.
- Roll and crawl information on the on-air channel from a specified source (another channel or disk) at the speed specified and between the line limits specified.
- Save a page of information displayed on the on-air channel by transferring it to the specified source channel.
- Write the contents of the source channel from a specified line onto a disk at a specified address.

In addition, the following features are provided on the Remote Control Panel:

STORE PRESET	Store a series of routines in memory.
CANCEL DISPLAY	Stops any function in progress and erases the on-air channel.
LOWER THIRD	Uses the lower third part of the on-air channel for any selected message.
EDGE CONTROL	Enters or removes edging on all characters on the on-air channel.
SPEED CONTROL	Modifies roll or crawl speed.

The PRESET function merits elaboration. A complete routine such as: DISK NO., MESSAGE ADDRESS, ROLL OR CRAWL, SPEED, WINDOW OR LINE NO., EDGE ON-OR-OFF, can be stored as a single PRESET SELECTION. Four routines may be stored and put on AIR merely by selecting the appropriate PRESET KEY and tapping TAKE. The ability to PRESET various routines is especially advantageous in programming rapidly changing data such as used, for example, during a golf match or basketball game or election returns.

### Edit/Graphics Channel Functions

One Edit Channel can handle up to five broadcast channels, although for maximum flexibility a one-for-one relationship may be desired. One edit channel may be used to compose for any or all the broadcast channels from one location and any message placed on disk may be called up by any channel. Redistribution of data between channels is accomplished by a simple channel-to-channel transfer.

The Edit/Graphics channel, an RCA innovation, highlights the flexibility of the Video IV. Composition or data update can take place in the Edit Channel simultaneously with the Broadcast channel being "On-Air". The new data can then be transferred to any Broadcast channel when required or it may be stored on disk—for future use.

The Edit Channel has many different functions in preparing data displays.

- a) Primarily it is used as a preview channel separate to the "On-Air" channel for a fail-safe check prior to airing. A simple "transfer" routine puts the same information in the "On-Air" channel for broadcasting.
- b) It serves as a second broadcast channel, although the characters are somewhat coarser than in the "On-Air" channel. Character, word, line, or full page flashing; and, if color encoded, character by character and background color are provided.
- c) Use the Edit channel for preparation and storage of new data on the disk while simultaneously recalling data for On-Air use. Existing files

may be continuously updated, for example, sports scores and statistics or election results, while other files are being displayed On-Air.

- d) With the 256 characters and symbols available from the Graphics Font, almost any type of graphic display may be composed. Maps, football plays, golf greens and fairways, etc. may be composed, stored, recalled, edited and aired as play progresses.
- e) In font composition the Edit channel is used to display the character in magnified form for precise editing and alignment. By this technique, the need to redraft artwork to correct or restyle characters is eliminated.





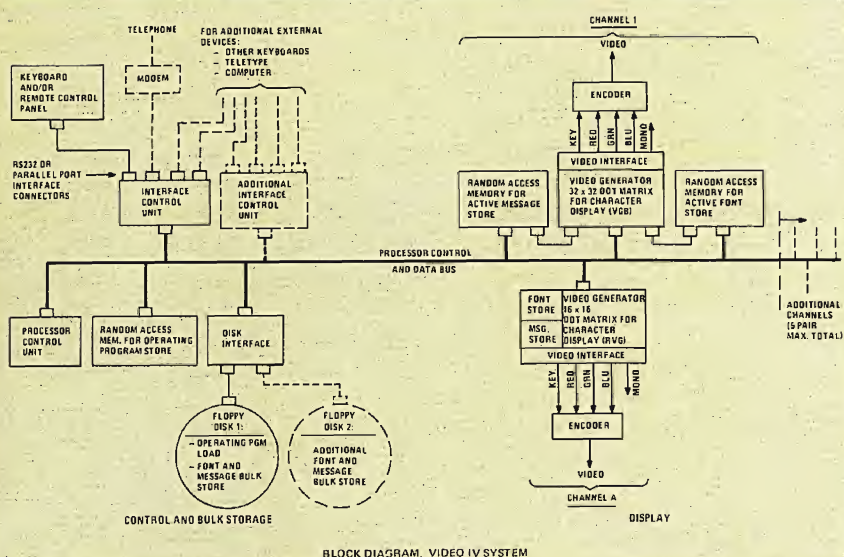
Information composed in the Edit Channel may be edited and transferred to the Character Channel, even when on-air.

The Graphics Font includes 256 characters and symbols, from which numerous types of graphic displays may be composed.

The Remote Control Unit may be used on any Video IV input, either with or without a keyboard.



Block Diagram, Video IV System. Control and bulk storage functions are shown on the left side of the diagram, and the display operations are on the right side.



Magnetic "floppy" disks are used for message storage. Memory is random, so any message in storage is available at any time. Each disk can handle 3070 addresses.

## STANDARD FONTS SUPPLIED WITH VIDEO IV

Font No.	Style	Description
1	SOUVENIR BOLD	64 Non-Touching Alpha-Numerics, Upper and Lower Case and Limited Punctuation. Proportionally Spaced Program Channel, 25 Characters Per Line, 10 Lines.
A	SOUVENIR BOLD	Same as Font 1 for Edit Channel
2	NEWS GOTHIC BOLD	64 Touching Characters, 1 Alpha Numerics, Upper Case and Graphics Symbols. 12 Lines, 25 Characters Per Line.
B	NEWS GOTHIC BOLD	Same as Font 2 for Edit Channel
3	NEWS GOTHIC BOLD	96 Non-Touching Characters, Upper and Lower Case Plus Graphic Symbols and Punctuation. 25 Characters Per Line, 10 Lines.
C	NEWS GOTHIC BOLD	Same as Font 3 for Edit Channel
D	GRAPHICS FONT	256 Alpha-Numerics and Graphics Symbols for Edit Channel Only, 64 Characters Per Line, 30 Lines.
4	NEWS GOTHIC BOLD	Same as Font 9, but with French Accents.
5	BLOCK MODERN	64 Touching Alpha-Numerics, Upper Case and Graphics. Proportionally Spaced, 25 Characters Per Line, 12 Lines.
6	SPORTS BOLD	64 Non-Touching Upper and Lower Case Alpha-Numerics Plus Punctuation. 25 Characters Per Line, 10 Lines.
7	NEWS GOTHIC BOLD	64 Characters and Logo Symbols. Large Upper Case (Shifted), Small Upper Case (Unshifted).
8	NEWS GOTHIC BOLD	3 Alphabets—Large Upper Case, 2 Sizes, Small Upper Case.
9	NEWS GOTHIC BOLD	64 Non-Touching Alpha-Numerics Upper and Lower Case Proportional. 25 Characters Per Line, 10 Lines. Limited Punctuation.
0	DATA DOCUMENTARY	Upper Case, Proportional. 25 Characters Per Line, 10 Lines, Alpha-Numerics.



### Operational Features

The functional block diagram illustrates the flow of data in the system. Up to four inputs are allowable, as long as they are RS232C compatible and use USASCII code. (Eight inputs if the optional second data interface unit is selected.) The system interfaces directly with telephone modems, computers, and teletypes and the keyboard/remote control systems. The data rate is normally 300 baud. (A baud is one bit per second.) Other speeds are available by switch selection up to 2400 bauds. Data can be transmitted from one Video IV to another Video IV and to other external devices also. Input and output are under control of the Input Control Unit (ICU) which in turn, is controlled by the Processing Control Unit (PCU) which determines when to receive or transmit data depending on whether other operations in the system have priority. Incoming data are checked for errors and routed to the "refresh" memory of the appropriate channel generator where it is converted to a video signal for display on a monitor or for program use. A decision may now be made to leave the data in the channel memory only or store it on the magnetic disk. Bulk storage of messages in the Video IV system is provided by a device known in the computer industry as a "Floppy" disk. This consists of a disk drive assembly which accepts a magnetic coated plastic disk supplied in its own protective envelope. The disk (in its envelope) is inserted in the drive unit just like the old style "45" RPM record players. The locking lever when secured, also activates the disk drive and the system is then "enabled".

By uncovering a perforation in the disk envelope, erasing and recording new data is inhibited and the safety of the system program or messages is ensured. A small piece of tape covering this hole in the disk envelope enables erase and record.

Storage for 146 separate full screen messages is typically available on one disk. Messages that require less than 10 rows of characters can occupy less space on a disk and permit storage of more than 146 messages.

Disks may be changed very rapidly—in a matter of seconds; however, to eliminate frequent disk changing, a second disk drive may be added as an option to increase the directly addressable library of messages. A third and fourth disk drive can be supplied on special order. Each disk has 3072 addresses with 21 addresses normally required for a full page of data.

### Program Storage

The program disk supplied includes the basic operating program, three pair of font programs (compatible Broadcast and Edit channels and one special Graphics Font for the Edit Channel only) and seven special program fonts. The balance of the disk can be used for storage of data; however, RCA recommends that the system program and font descriptor programs be stored on disks separate from the programmable message data particularly in multi-disk drive systems.

### Data Retrieval and Transfer

Data, in the form of alpha-numeric titles, score boards, team rosters, or graphics may be retrieved from the disk through any input device such as the keyboard or the remote control panel. Under control of the PCU, the data is read off the disk and into any channel desired. (The basic Video IV is in effect, a two-channel system since both the broadcast channel and the edit channel may be used on air simultaneously if switcher inputs are available.)

Data may be transferred back and forth between channels on command. The data word for each character position includes symbol background color as well as symbol edge color, and flash. The font description program for each channel is stored in Random Access Memory associated with that channel. The PCU is *not involved* in displaying a message once the message and appropriate font has been called off the disk and *committed to the display* refresh memory and font memory of a given channel.

### Video Generator Outputs

The video generator outputs are: RGB, an edge key signal (slightly larger than the character size), and a monochrome

composite video signal. The RGB signals, noncomposite, are fed to a color encoder. Here the signals are converted by the encoder to composite color Video either NTSC, PAL or PAL-M. Each Video IV channel, "On-Air" or Edit can be operating on a different color standard if separate encoders and sync sources are used.

The Edit and Graphics channel has the same outputs except that a separate edge signal is not available. If colored graphics are desired, a second encoder may be selected to utilize the RGB outputs.

The Video IV provides a key signal output as well as RGB outputs for feeding to an encoder. The output from the encoder may be used as a source input to the switcher grid and the Video IV key signal used as an external key input for the mixers, as shown in the systems diagrams. This permits letters to be wiped in and out, either superimposed upon or in place of the program material.

Alternatively, the Video IV key and RGB outputs can be used with an encoder/insert keyer and a 2 x 1 switcher installed downstream of the switcher as shown in system application diagrams.

### Character Edging Facility

The edge key signal is used to enhance the characters, especially when they are in color, in order to make them more legible when keyed into color pictures.

In the Video IV system, the character edging has the same dot quality as the characters themselves, and may be used alone, producing an attractive "skeleton" effect. The edges themselves may be colored, producing the best combination of edge tint and character tint to produce the optimum impact in the captioned picture.

### Programming the System

The Video IV is organized as a data processor which it is. The software program for routing the flow of information between the keyboards, remote controls, disks, other input/output ports, and the display "refresh" memories of the various channels is loaded

into the Random Access Memory on start-up from a magnetic disk under control of a Read Only bootstrap program. This "initialize" process readies the system for message composition and display and requires about 2 minutes. The operating software disk may then be removed and replaced with a message disk, after which the system is capable of performing all of its prescribed functions with the one exception of font compose.

During the "initialize" sequence, Font No. 1 is read from the operating software disk into the Random Access Memory of the Program and Edit channels. If another font is desired, a simple keyboard routine recalls it from the operating software or font disks and stores it in the memory. The time required to change fonts is about 7 seconds.

Since font structure is really a software program, any number and style of fonts may be used in the Video IV system. Fourteen fonts are stored on the operating software disk. Additional fonts are available from font disks. The composition and description of the various fonts are listed in the table.

Font Compose requires a unique software program, for which a separate disk is supplied. While in the Font Compose mode, the system cannot be used for normal functions. However, this is hardly a restriction, since Font Compose can be done quite rapidly with the Video IV system and can be accomplished while the system is Off-Air.

#### **Display Format Characteristics**

The broadcast channel has two selectable formats—50 half size characters by 10 lines and 50 half size characters by 12 lines. With the 12 line format, the symbols can touch both vertically as well as horizontally.

The Edit/Graphics channel has three character position formats, two to match the on-air channel and the special graphic format which, in the safe titling area, has 64 character positions

per row and 30 character rows, touching horizontally and vertically.

For the "On-Air" channel, the program contains information which assigns an address number to each of 500-600 spaces in the television picture. (10-12 lines, 25 full space or 50 half space per line.) These spaces are selected by operating the cursor controls, a set of 4 keys with arrows which position the cursor up or down, left or right. Now when a key is struck, "A" for example, the program tells the Video generator to write an "A" in the space occupied by the cursor. It also tells the generator how to write it—shape, size, accents, etc.

#### **Font Compose Methods— Keyboard and Camera**

Two methods of font compose and Edit are available with the font compose program. In the first method, the keyboard alone is used to create new characters or modify existing ones.

Keyboard composition is started by drawing the character or symbol on a sheet of 32 x 32 coordinate paper. Then a keyboard routine creates an arrowhead display in the left half of the raster. (See illustration.) Now the cursor is moved to a starting point as called out on the artwork and merely tapping the WHITE key in accordance with the character outline fills it in, using the cursor for indexing. The SPACE bar or "BLACK" key is used for the dark areas. As the keys are tapped, the character takes shape on the monitor. Since the character is blown up to over 10 times its normal size, every detail is revealed and errors may be corrected or styling changed without modifying the artwork. When a character is complete, the particular character and "Enter" keys are tapped and storage takes place. The symbol in final form will now appear in its proper font location on the program channel monitor.

For example, a new "E" might be created. To enter this in the font, strike "E" on the keyboard and the ENTER key. From there until changed, this new "E" will be written when an E is called for. Using this keyboard tech-

nique, it is also possible to extract a character from a font and modify it. The font is displayed on the Program Channel monitor while the editing is done on the edit channel monitor. The final font may thus be seen taking shape. This technique could also be used for cryptography, since the whole font could be scrambled.

#### **Camera Compose Capability**

An even more powerful system is camera font compose. By means of the font compose program and the addition of a Video Sampling Interface Unit, any source of video signal, but preferably a Vidicon Camera, can be used to scan character artwork, digitize it, and store it as one character in a font. The same technique may be used to create logos and other graphic symbols.

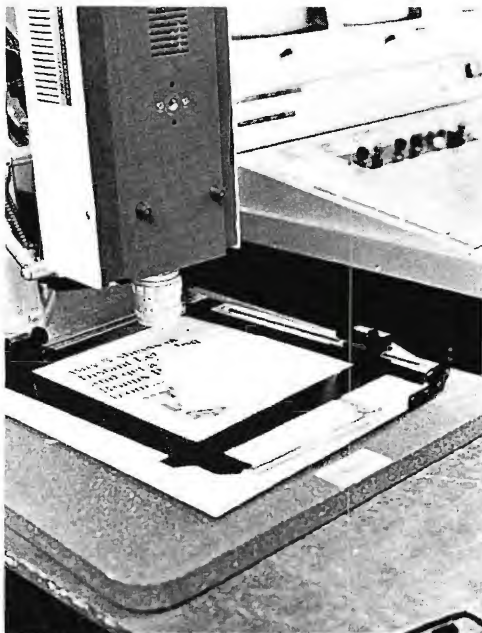
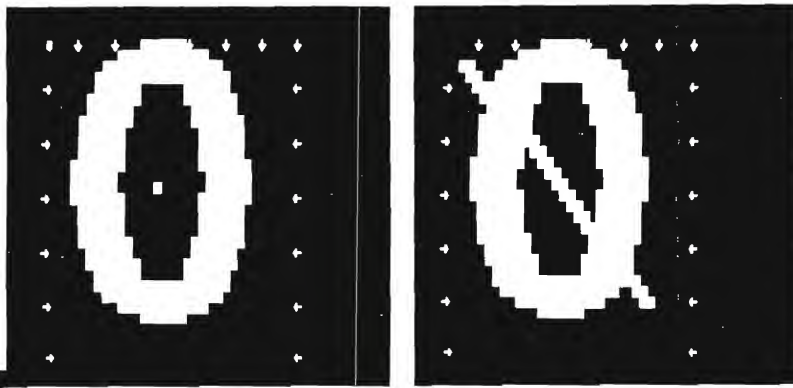
The Video IV Font Compose program generates a 32 x 32 matrix on the edit channel monitor. The camera mounted on a conventional amateur style enlarging easel is focused on the artwork and adjusted for size and definition. Nominal illumination is required. Contrast is adjusted by using a key on the keyboard.

Camera compose expands the programming capabilities of the Video IV to the point where its full capabilities will rarely be completely explored by a production staff. In addition, the software program offers the potential of even more expansion of the system capabilities in the future.

Either white on black or black on white artwork is acceptable. Other shades and colors give varying results; however, the digitizing process is not critical and very good results can be achieved with marginal material and moderately noisy video.

The artwork is mounted in a standard enlarging easel and is easily moved about manually to properly align and position it in the grid. When ready the scan key is pressed and the character can be seen taking shape on the edit monitor. After composition, the keyboard compose routine may be used for touch-up.



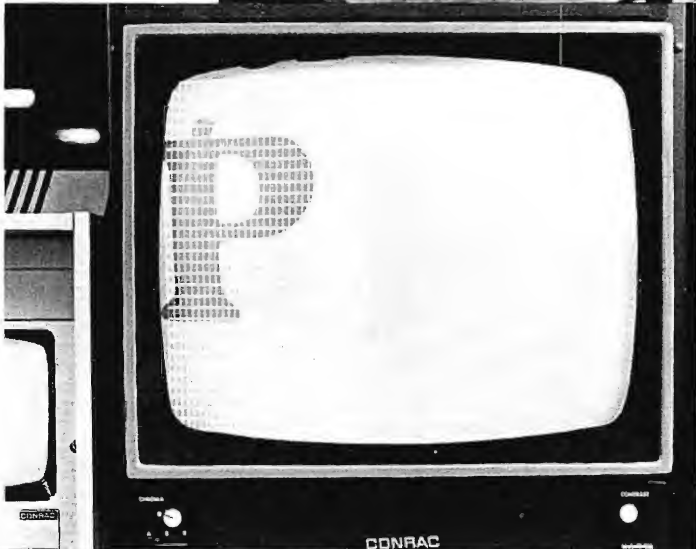


Unedited character (left above) ready for Font Compose. Note edit symbol in the center. (Right above.) Character after modification, with Font Compose symbol.

Camera compose enhances versatility of Video IV System. It can be used to create new fonts, logos or other graphic symbols for permanent storage.

Video IV camera-composed station logo for WREG-TV, with matrix display.

Camera artwork is mounted on a standard easel, with the camera manually adjusted and focussed for best resolution. Camera picture is displayed on matrix grid for scanning (bottom left). Either white on black or black on white artwork is acceptable.



An additional mode enables eight characters to be displayed on the Edit channel at once. This allows the composition of touching characters so that logos or other graphics may be stored in larger form. Each part of the logo depicted by one of the 8 segments is then assigned to a key. The logo may then be stored on a disk for recall or composed in animated fashion by punching the appropriate keys.

Once the character is composed and displayed it may be moved about within the 32 x 32 matrix to achieve proper horizontal and vertical spacing.

#### **Font Characteristics**

Starting time resolution for all characters and symbols in the broadcast channel is 50 nanoseconds, or approximately 1/64" on the screen of a 19" monitor. This provides a very high quality character structure with excellent legibility as seen on a home receiver. The 32 x 32 matrix of which each character is composed eliminates almost every vestige of jaggedness on sloping lines. The Edit channel, however, does produce characters somewhat coarser in nature, since limitations imposed by the font descriptor memory limit the matrix structure to 16 x 16 or 8 x 8. The characters are equally legible, but do have a "computer generated" appearance.

The alpha-numeric fonts are composed to occupy no more than 128 half spaces in the memory. Full size characters will occupy a full space (A, W, M, etc.). Others will take only a half space (I, !, l, etc.). Relating this to the message as seen on the monitor, 25 full size characters may be written on a line

with 10 lines being available in the safe title area. If two of the characters are half spaces, then a line would accommodate 26.

#### **Systems Applications**

Since the Video IV is effectively a system with two distinct video outputs, there are several options on how it may be integrated into a video switching complex. The simplest, of course, is with an insert keyer on the output of the switcher as shown in diagram. Only a simple keyer which responds to the Edge Key signal is needed so that individual character and edge colors are preserved. Colorizer type keyers will delete the colors created by the Video IV and insert their own single internally generated color. The edit/graphics channel is handled the same way except it does not have a corresponding edge keying signal.

Another method is to route the Video IV outputs through the production switcher special effects system. (See diagram.) This has the advantage of utilizing the Mix/Effects system to fade, wipe and wipe key between the broadcast and the graphics displays.

#### **Up to Five Channels in Single Rack Assembly**

Video IV is normally assembled and shipped in the RCA Standard BR-84 series of cabinet racks. Even a 5 channel system will occupy no more than a single rack.

Since all connections to the system are plug-in, installation time is minimal. Video connections are BNC. The power consumption varies from 1.2 kW

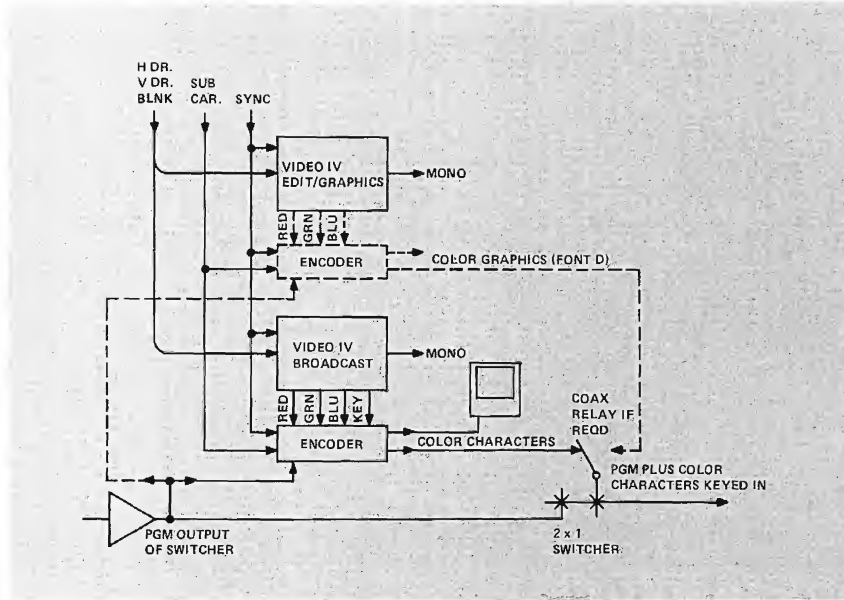
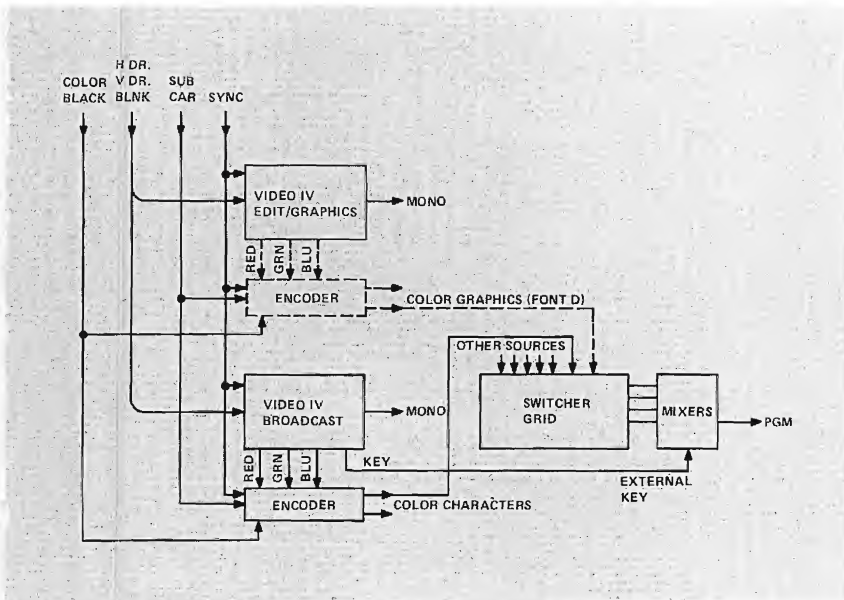
for the smallest to only 2.0 kW for the largest system. Systems are shipped connected for the voltage on which they will be used, 115 v. or 220 v., 48 to 62 Hz.

Four input connectors wired for RS-232C modem compatibility are provided on the input panel located near the bottom of the rack. A sync distribution panel in the same area has five inputs to accommodate sync, blanking, subcarrier, horizontal and vertical drive. An auxiliary sync generator which requires only composite color, black burst, or Comsync input is highly recommended to simplify installation and system timing. The Video outputs are taken directly from the color encoder.

#### **Versatility for Changing Needs**

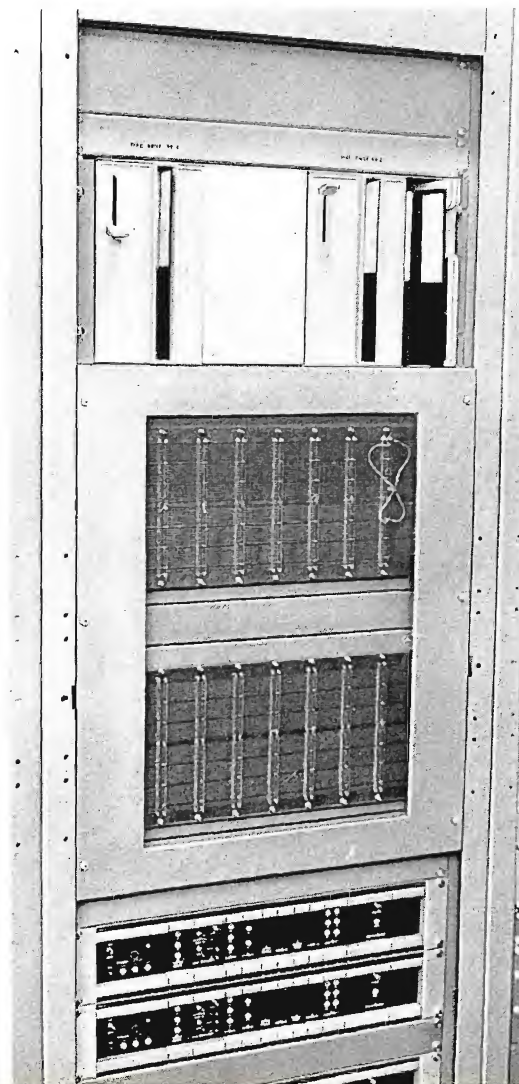
One of the most attractive aspects of the Video IV is the ability to expand or change the system to take advantage of advances in the state of the art. For example, greater font capacity can be achieved by changing the 4 K random access memories to 8 K memories when they become available. This would only require substituting a new module for the existing one and a new software disk as part of the update program. As other accessories become available, they will integrate into the system in a straightforward manner with software update routines supplied by RCA to accommodate them. Thus, obsolescence should be a negligible factor in the decision to purchase a Video IV. A Video IV installed today not only gives the user a very flexible character generating system, but also a system which is designed to readily adapt to anticipated future needs. □





Two options for integrating Video IV into video switching systems are shown. In left diagram, Video IV is used with an insert keyer at the switcher output. The right diagram shows the Video IV outputs routed through the production switcher special effects system.

Video IV rack, with two disk drives at top and the computer circuitry below.



# TURNSTILE II:

## Super-performance antenna for lowband VHF

R. L. HOOD, VHF Antenna Product Analyst

In TV antenna design, the state of art is such that breakthroughs in technology come infrequently. For highband VHF broadcasters, the Traveling Wave Antenna represented a major advance—a design superior in performance and simplicity.

The success of the Traveling Wave spurred interest in a similar super-performance antenna for low and mid-band VHF channels 2-6. This new antenna—the Turnstile II—is now available. Its design is based on the concept of the Superturnstile Antenna which, because of its simplicity, electrical characteristics, and versatility, is the most popular TV broadcast antenna in use.

A six-bay turnstile, the T-II Antenna provides a 2:1 improvement in antenna VSWR (Voltage Standing Wave Ratio), with resultant improvement in picture quality and reduction of ghosts caused by antenna reflections.

### Design Criteria

In designing the Turnstile II, it was decided to retain the turnstile or rotating phase feature employed in the original RCA Superturnstile. Further criteria were established to improve on the features and performance of the Superturnstile and these are listed below:

- Superior Performance—with a VSWR of 1.05 or less across the entire channel band
- Omnidirectional Stand-by Capability—using the dual 3 1/8" 50 ohm Universal inputs to split the antenna vertically

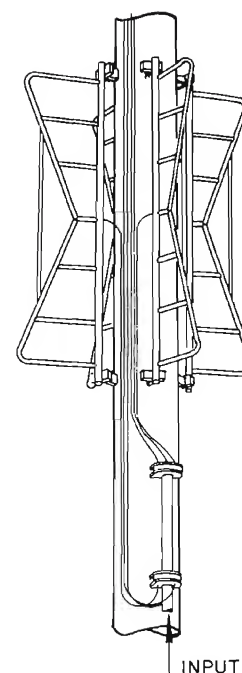
- Minimal Performance Affects Under Heavy Icing Conditions—with the new feedsystem
- Newly-designed Feedpoints—eliminating flexible feedstraps
- Easy Assembly—with flexible feedlines and less hardware
- Fully-developed Design—permitting antenna assembly on site

The results are depicted in the accompanying table.

### Feedsystem Advancement

The most salient electrical improvement to the T-II design is the "double cancellation" effected by the feedsystem. Figure 1 shows the heart of the feedsystem. Note that the first set of cancellation occurs in the junction boxes which provide the phase quadrature between the North-South and East-West sets of radiators. With this design, all predominant mismatches caused by the natural bandwidth of the radiators, manufacturing or assembly tolerances, and icing weather conditions are cancelled. This is not the case with the Superturnstile Antenna or other batwing antennas as these affects are propagated down the transmission lines to the transmitter and reflected back to the antenna causing a potential visible ghost.

A second degree of cancellation is attained by having the junction boxes 90 degrees out of phase to each other. Thus, any mismatches caused by the junction boxes themselves are cancelled. Figure 2 is a photograph of the developmental model of the junction box.



The benefits of the T-II "double cancellation" feedsystem under conditions of mismatches are quite dramatic. For example, with a load VSWR of 1.3 that may be caused by heavy ice formation on the antenna radiators, the VSWR at the input to the junction box remains significantly below 1.05 at picture carrier. This means less antenna ghosting and transmitter "trip-offs" under severe icing conditions.

A further look at the T-II feedsystem shown in Figure 1 reveals that dual line antenna input "splits" the antenna vertically whereby one transmission

TABLE I

Item	Original Superturnstile	T-II
Max. input VSWR Across Channel 2	1.10	1.05
Sensitivity to Icing	Yes	No
Feedlines	Aluminum/Copper	Copper
Flexible Feedlines Sensitivity to Pressure Leaks	Yes	No
Omnidirectional Coverage in the Stand-by Mode	No	Yes
Feed Point Jumper Sensitivity to Excessive Vibration	Yes	No
Bridge Combiner for Audio/Visual Combining Network	Yes	No
Notch Diplexer for Audio/Visual Combining Network	No	Yes



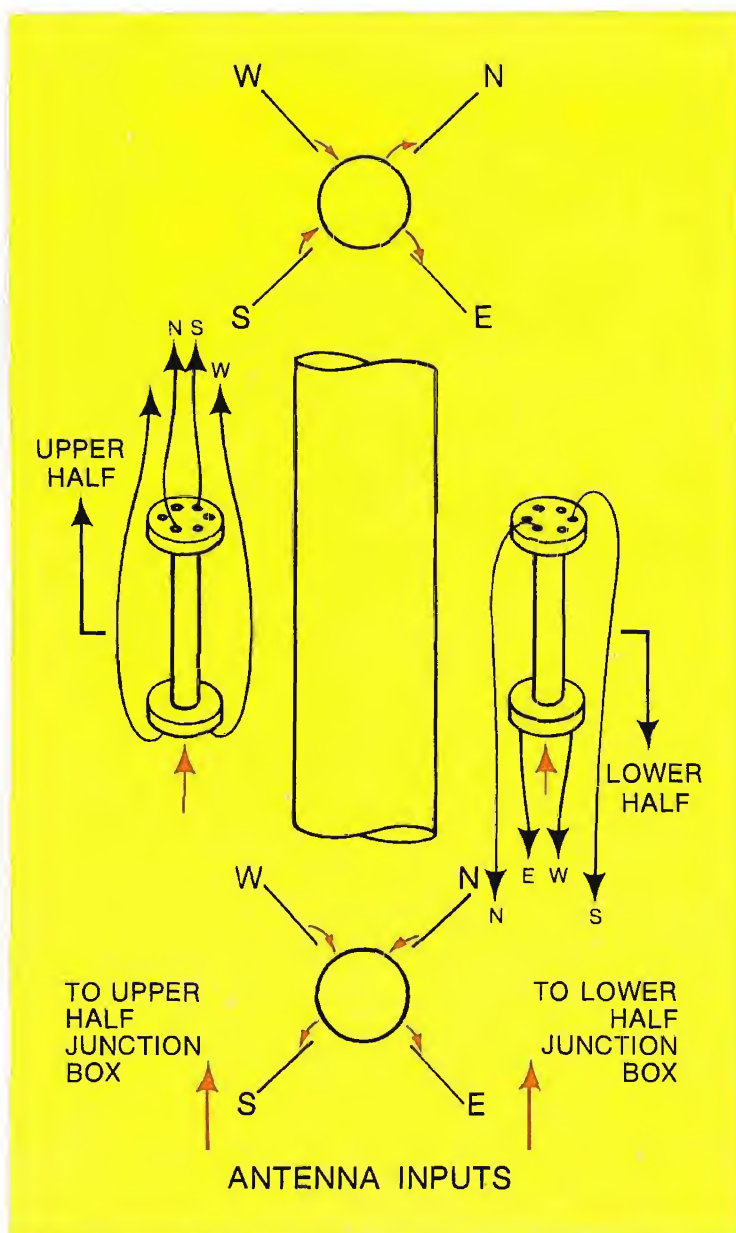


Fig. 1. Feedsystem for Turnstile II Antenna.

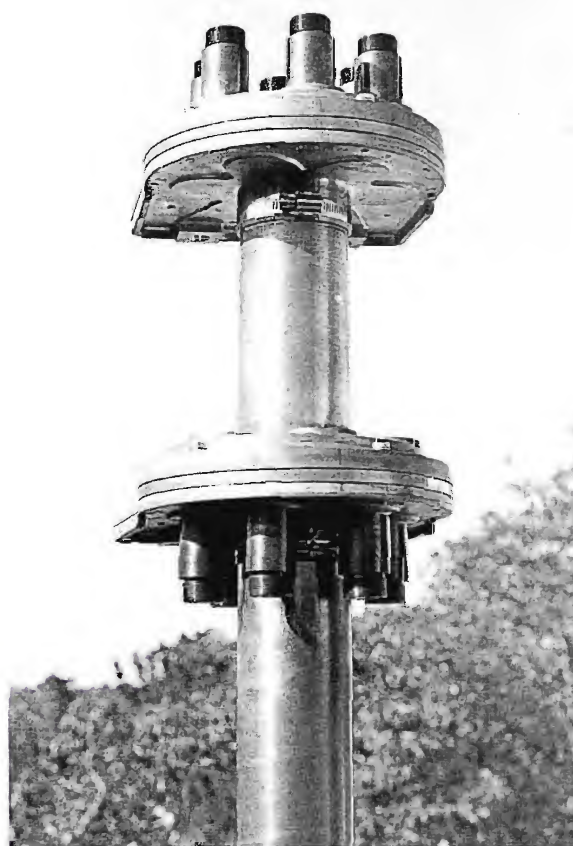


Fig. 2. Developmental model of Turnstile II Junction Box.

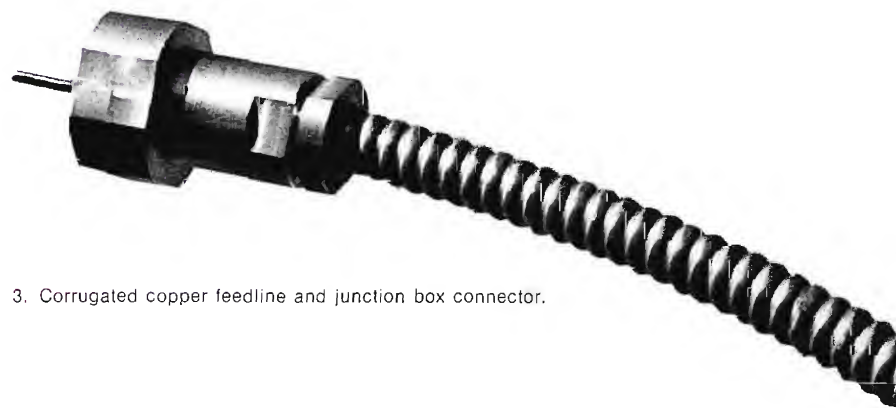


Fig. 3. Corrugated copper feedline and junction box connector.

line excites the entire upper half of the T-II Antenna and the second line excites the lower half. This compares to the North-South and East-West "split" in the Superturnstile Antenna. The primary advantage of this dual line arrangement is that omnidirectional service is attained by feeding only one transmission line in an emergency mode as compared to a figure-eight horizontal pattern achieved in the Superturnstile.

#### **"Batwing" Radiator Redesign**

The second most important contributing factor to the superior performance of the T-II Antenna is the redesigned "batwing" radiator elements. This new radiator has a 2:1 improvement in performance due to its greater bandwidth as compared to the Superturnstile radiator.

#### **Electrical and Mechanical Characteristics**

As stated previously, the T-II Antenna has a maximum input VSWR specification of 1.05 across the entire operating channel. The antenna has a nominal gain of six times that over a half-wave dipole. The peak TV picture power rating is 40 kW, and this provides 20 kW of omnidirectional stand-by power capability with each half of the antenna.

Unjacketed corrugated copper feedlines are used in the T-II feedsystem. Figure 3 is a photograph of the feedline and the junction box connector. These feedlines are flexible, permitting dressing to the antenna without the need of any bending fixtures. Further, they are foam-filled, eliminating possible degradation in the electrical performance of the antenna caused by dents in the outer conductor or moisture in the lines. The T-II Antenna employs an essentially rigid feedpoint between the feedline and the batwing radiators. This has eliminated the use of a flexible jumper strap that is sensitive to breakage under excessive vibration or rigger climbing damage.

The T-II Antenna employs dual  $3\frac{1}{8}$ " 50 ohm inputs that mate with the female end of RCA  $3\frac{1}{8}$ " Universal transmission line. The antenna pole is supplied with a tower bury section. As with all RCA antennas, the T-II Antenna is designed in accordance with EIA Standards Section RS-222B and is independently certified as to structural integrity for rated conditions.

#### **Flexibility in Application**

Various T-II Antenna transmitting systems can be implemented. For each of these, a single-ended Notch Diplexer must be used to diplex the visual and aural signals because of the phase relationship of the T-II antenna. This requirement is demonstrated in Figure 4.

The output of the Notch Diplexer can be split either in the transmitter building or at the tower top. These two systems are shown in Figures 5 and 6 respectively. Note that the two line system provides the omnidirectional stand-by capability.

Because the T-II is a "fully-developed" antenna, as is the Superturnstile, the antenna can be assembled at the site rather than at the factory. This eliminates the cost of shipping a factory-assembled antenna and the concern for shipping damage. The T-II Antenna equipment supplied include: antenna pole, pole socket, guide flange, batwing radiators, 4 prong branching lightning protector, beacon cable (less beacon), feedlines, junction boxes, and all the necessary hardware.

The Variable Transformers and the Hybrid Coaxial Couplers are not supplied with the antenna. Referring to the two line system, one MI-561532 Non-pressurized Hybrid Coaxial Coupler with one MI-561775 RF Load is required in the transmitter building. Two MI-561776 Variable Transformers are required for the inputs of the T-II antenna at the tower top. The single line system requires one MI-561774-CH Pressurized Hybrid Coaxial Coupler

with one MI-561775 RF Load and one MI-561776 Variable Transformer be located at the tower top.

For replacement of an existing RCA Superturnstile with a new T-II Antenna, the new system would be as shown in Figure 7. Note that an existing Bridge Diplexer may be used and that 50/51.5 ohm transformers may be required at the antenna input if the existing line is 51.5 ohms.

Optimum performance is a basic reason for investing in a Turnstile II Antenna. The recommendations noted above permit the antenna system to achieve the best obtainable performance. This is why Variable Transformers are recommended at the tower top to "tune-out" any mismatches caused by the tower top transmission line complex and a Hybrid Coupler is recommended instead of a power dividing tee to take advantage of reflection absorption.

#### **Summary**

The Turnstile II Antenna is the most advanced design currently available to the VHF Low and Mid-band broadcaster, providing picture quality vastly superior to that ever before attainable for Channels 2 through 6. The Turnstile II, along with concurrent development programs (circularly polarized TV antennas for example) demonstrates RCA's capability and on-going commitment to provide broadcasters with the best antennas available.

**WSAV-TV, Savannah, Ga., will become the first television station to install a Turnstile II antenna. The antenna will be mounted on Channel 3's new 1549-foot tower located west of Savannah. Also to be installed is an RCA TT-25-FL, 25 kW transmitter.**

**Harben Daniel, President and General Manager of WSAV, Inc., said that the new tall tower facility will increase the station's coverage area by approximately 50 percent.**



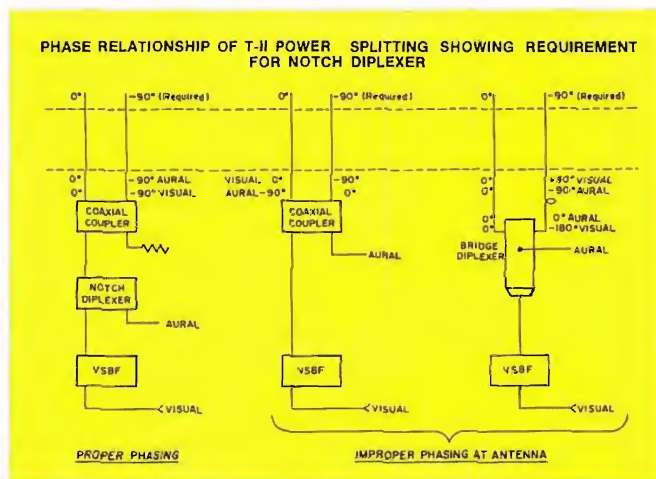


Fig. 4.

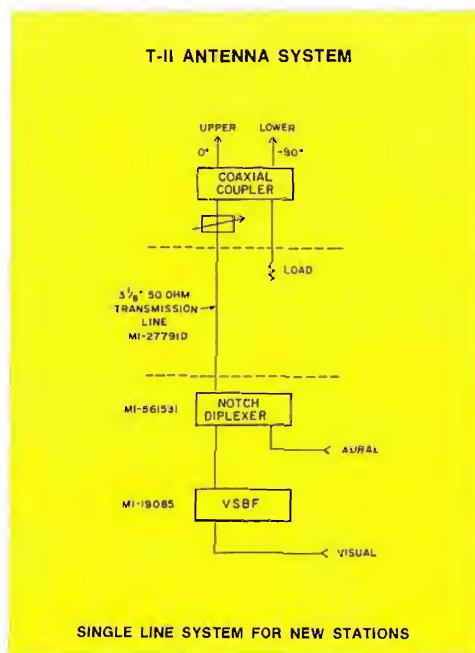


Fig. 5.

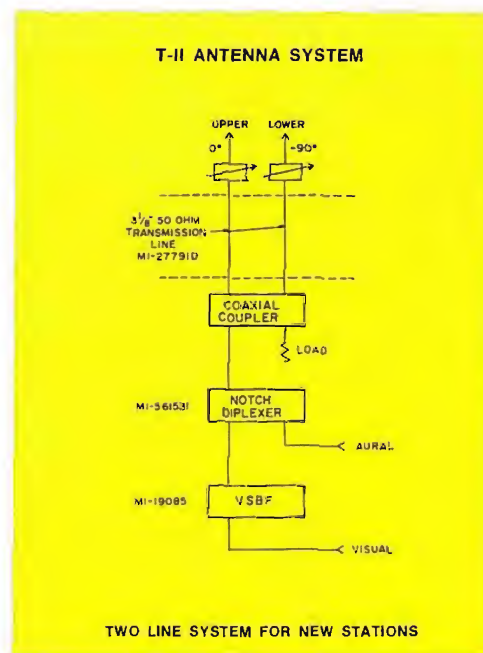


Fig. 6.

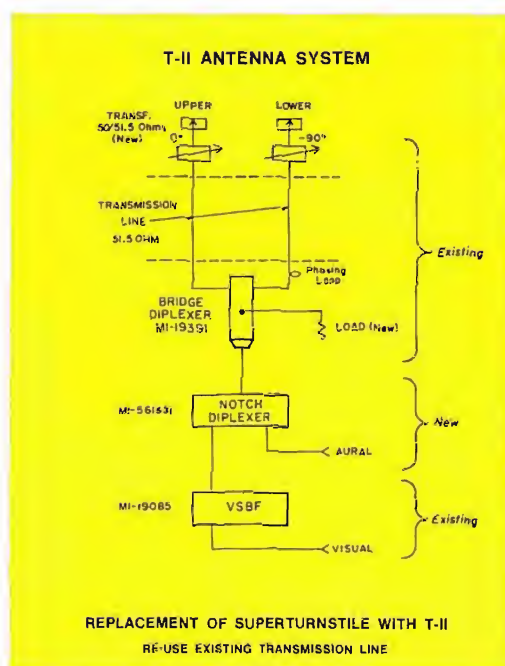


Fig. 7.

The only thing the RCA TKP-45 has in common with other portable TV color cameras is portability. From there on, it's an almost total departure from anything else.

As portable as you want to be.

With the TKP-45, the cameraman has up to 1500 feet of small-diameter, lightweight cable leading to the CCU. It has just half the weight of other minicable. There's no backpack to add weight, no tangles to avoid. Your cameraman can concentrate on picture-getting.

A lightweight junction box is belt-worn, for two-way intercom and audio pickup. And portability imposes no restrictions on lens selection, automatic video control, or any of the TKP-45's studio camera features.







### Meanwhile, back at the studio...

Place the TKP-45 on a tripod or pedestal, and—presto!—it's a full-capability studio camera. Indoors or out, you can use fixed optics (teles, wide-angles, fish eyes), or zooms through 34:1 ratio; the choice is yours.

Pick a 3" or 7" viewfinder—no compromise to camera size in the viewing department. Let the TKP-45 perform beside a TK-44 or TK-45, then try to tell the difference. A full range of automatic controls and video performance features says you can't!

### For proof, ask MTS.

MTS, Mobile Television Services, is a teleproduction company on the move—to the tune of 20,000 miles in its first four months. This unique firm operates a 40-foot mobile unit that houses more than a million dollars' worth of broadcast television gear. The equipment, equal to many a commercial broadcast station, includes:

- 5—TK-45A color cameras with joystick controls
- 1—TKP-45 portable color camera
- 2—TR-61 video tape recorders
- 2—Slo-Mo video tape recorders



Custom audio and video switching systems

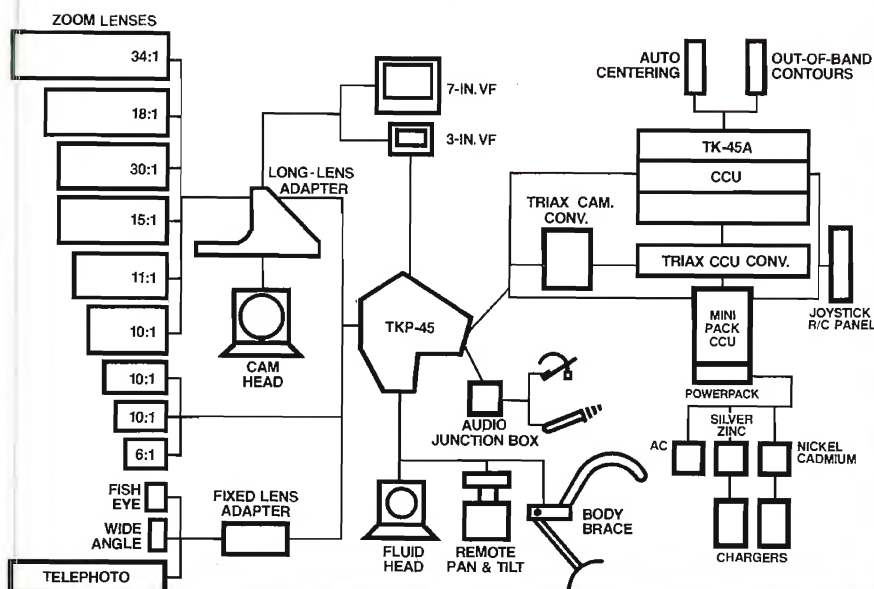
MTS began in mid-1974 as the production company for the World Football League's "Game of the Week". The first season involved 20 games, including WFL action and bowl games, the Miss World Pageant, several "Wide World of Entertainment" segments for ABC, and the new show, "Almost Anything Goes."

### TKP-45 gets the action.

Right from the start, the TKP-45 played an integral part in every production. At



### TKP-45 UNIVERSAL CAMERA SYSTEM



We'd welcome the chance to pit the TKP-45 against any newsgathering or studio cameras to prove that "you can't beat The System" for quality and features at an attractive price.



the sports events, it is used to capture action scenes and impromptu interviews, with all the picture quality of its TK-45 companions. And it adds tremendously to MTS' in-studio productions.

Quality is the MTS cornerstone. "You're only as good as your last job," says MTS Executive Vice President Howard Zuckerman. "Every assignment must be done right, without skimping or corner-cutting."

It's no coincidence that MTS picked the TKP-45 to add the final touch to its RCA camera lineup.

**RCA**



